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Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

Smithsonian Institution,
APR 21 1914
National Museum.

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

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ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

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AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

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The Design of Combination Fixtures.[1]

By CLARENCE A. PETERSON.

In dealing with lighting installations, it is important that the fixtures be designed with reference to their appearance as well as to their utility. For commercial installations the main object is to furnish a certain intensity of light (seeing value) on the working plane. If the installation gives a high illuminating efficiency and good optical effects, the system is called successful, whether or not the fixtures possess beauty or artistic merit.

The extent to which the comfort of the eyes deserves consideration should depend very largely upon how the eyes are used. Rooms used for clerical work, or labor demanding close attention, require different treatment than lobbies, concourses or similar places used principally for passage, and in which the eye is seldom subjected to the strain of close application. In all cases, however, the glare from exposed or over-brilliant light sources should be avoided, because it has neither artistic merit nor economic value.

In buildings of a monumental character, esthetic considerations are naturally foremost, and regarding these, it is not possible to give hard and fast rules. Special attention must be given to the fixture design as well as to the method of directing the light, in order to bring out the effects intended by the architect. Fixtures for this class of work must give good illuminating results, and also be of proportion and style to harmonize with the decorations, and appear an integral part of the architectural treatment.

A fixture for a room in French Renaissance, for instance, demands quite different detail from one for Gothic finish. (Figs. 1 and 2.) Fixtures for Colonial finish, on the other hand, may have similar ornamentation to the classic style, but is differentiated from the latter by its more delicate proportions and detail.

The relative size of the fixture parts must be determined by the size of the room and by the number in the room and the distance between them. A room 20 feet square will require a fixture of comparatively large proportions if only one is used, while if four are used the proportions will be greatly reduced, the arms made shorter and the lights mounted nearer the ceiling. For commercial lighting, the choice in the number of fixtures is governed generally by the number of occupants in the room and the use to which the room is put.

In the common systems for direct lighting, in which the lamps are suspended from ceiling fixtures, the distribution obtained from extensive or intensive types of satin finish, prismatic, or medium density opal reflectors, will illuminate walls and ceilings to a sufficient degree, and the direction of the light and the arrangement of light and shade will usually be satisfactory under those circumstances. Reflectors giving a very small amount of light in the upper hemisphere are generally not desirable. Ball globes are quite satisfactory, although somewhat inefficient in illumination of the lower hemisphere.

The different forms of indirect and semi indirect lighting afford excellent methods for showing detail and general effect of interior decorations. Discretion must be exercised, however, in using either of these systems. The light source must be located properly with respect to the reflector, in order to light the ceiling uniformly. And the fixtures must be readily accessible for cleaning, since dust accumulates rapidly and affects the efficiency a great deal more than for direct lighting. For this reason they should not be used for high ceilings unless provision is made to lower the fixtures for cleaning.

The mounting height of the lamps and the location of the outlets, are governed by the size of the room, the ceiling height and architectural treatment. In the first place, the outlets must be so located that it is possible to provide fixtures which will direct the light in a proper manner to bring out the architectural features. For instance, with a pannelled or vaulted ceiling, if a fixture is not placed in each bay, care must be exercised to avoid an unevenly lighted ceiling. Each case requires special consideration in this respect.

A light of high intrinsic brilliancy, while more spectacular, is generally not desirable. The eye invariably fixes upon the brightest spot and this detracts from the general effect.

The choice of illuminants is governed by reliability, economy of operation and convenience in control.

Reliability of service is of the utmost importance, but rarely receives consideration until a supposedly dependable service is put out of commission by an unforseen contingency. The combination fixtures, therefore, may be regarded as an insurance against interup-

1. Transactions Illuminating Engineering Society.

Fig. 1.—Gothic Combination Fixture.

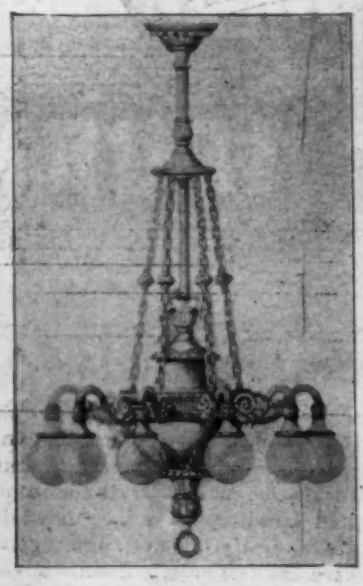


Fig. 3.—Fixture Suitable for a Classic Interior.

Fig. 2.—French Combination Fixture.

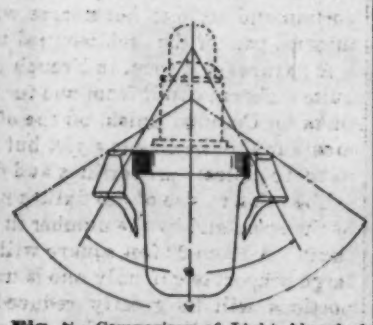
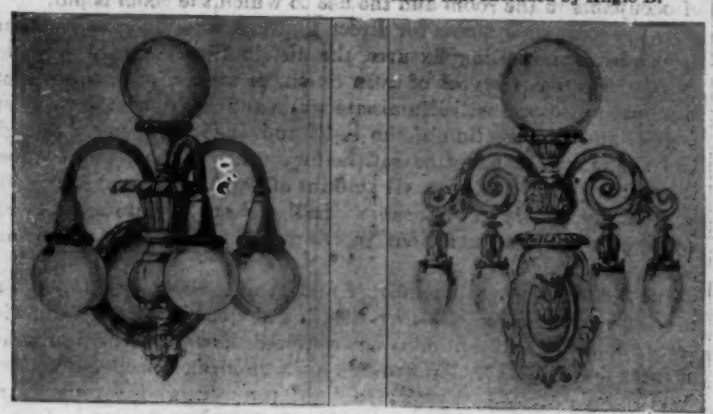


Fig. 8.—Comparison of Light Absorbed by the Common and a Newly Designed Burner. Zone of angle *A* is about four times that Included by Angle *B*.



Figs. 4 and 5.—Side Fixture for Classic Interior.

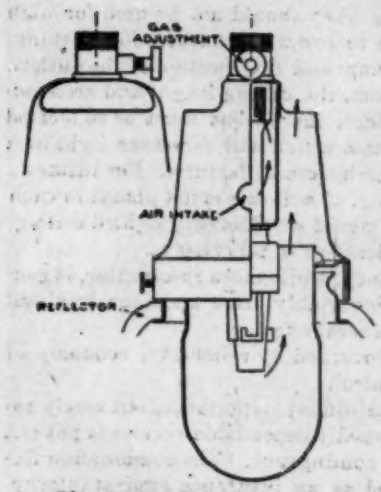


Fig. 6.—Sectional View of a Gas Burner.

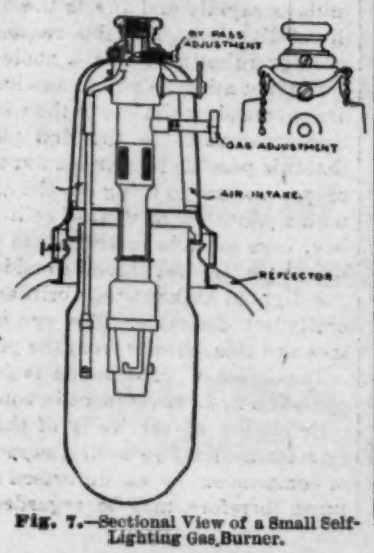


Fig. 7.—Sectional View of a Small Self-Lighting Gas Burner.

Fig. 9.—A Fixture Designed Along Plain Lines.

Fig. 10.—Adaptability of a Gas Burner to an Ornamental Fixture.

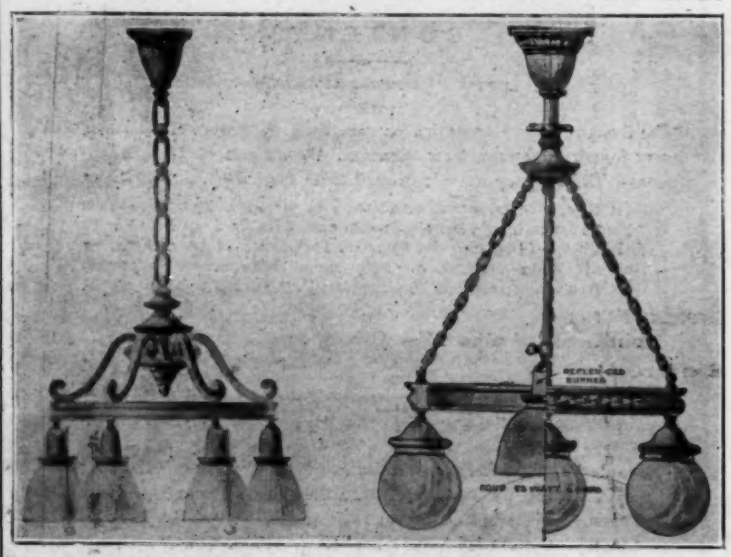


Fig. 11.—A Fixture with Alternate Gas and Electric Units.

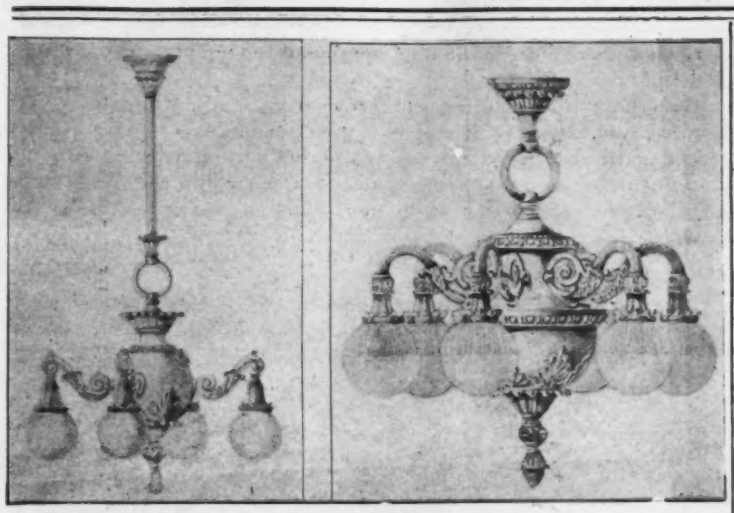
Fig. 12.—A Fixture having a Gas Burner in the Center of four Electric Units.

Fig. 13.—A Fixture Adopted to Gas and Electric Units.

Fig. 14.—A Combination Gas and Electric Semi-Indirect Fixture.

tion and are amply justified upon these grounds alone. The installation of parallel systems, with combination fixtures, insures reliability of service, permits taking advantage of probable future reductions in the cost of either illuminant, and should always be installed where economy of operation and reliability of service are important.

While the performance of both gas and electric lamps is seriously affected by variable conditions of energy supply, the bearing of this matter upon the selection of illuminants is quite different. Electric lamps, though suffering a reduction in light output from decreases in voltage, are not permanently impaired, nor are the means of control interfered with. Gas mantles, on the other hand, when furnished with gas of varying specific gravity or at irregular pressure, are apt to accumulate carbon, which can only be burned off by readjustment of the lamps. Furthermore, the pilot system of ignition, by which



Figs. 15 and 16.—Fixtures Suitable for Gas and Electric Light Units.

remote control is made possible, requires a gas supply varying but slightly in pressure and quality.

The actual operating economies of gas and electric lamps depend very largely upon the quality of service as well as upon the cost of the illuminants. While fluctuations of electric voltage produce much more serious effects than fluctuating gas pressure (as to efficiency of light production) electric voltages are much more closely regulated and good service conditions are much more prevalent than with gas. Both gas and electric companies, however, are lately paying more attention to supply service; but the electric companies have shown a greater willingness to appropriate money for the improvement of their service in this particular than have the gas companies, although the latter are able to accomplish it by inexpensive governors regulating the pressure within narrow limits. Where uniform pressure cannot be maintained, governors should be furnished as a part of the service.

The maintenance of glassware in good condition deserves much more attention than it usually receives. Accumulations of dirt on gas and electric glassware seriously affect their light giving qualities and cleaning should be done at regular intervals. It is a curious fact that windows are regularly cleaned to let the light in, but the lamps will not be cleaned to let the light out.

Gas lamps properly adjusted, furnished with clean gas at uniform pressure and quality, and fitted with good mantles, will require very little attention, and it has been the writer's experience that, under good conditions of service supply, there is little to choose between the maintenance labor required for either illuminant.

While a light source is always attractive, there is no natural desire to see the mechanism by which it is produced. Therefore fixtures having artistic merit must conceal the operating mechanism of the lamps. To accomplish this on combination fixtures, a new type of gas burner has been developed (Fig. 6). The body consists of a one piece casing of same size and design as the electric socket covers used, with openings near the top for the products of combustion. The casing incloses the air chamber containing a mixing tube, gas regulating valve, and mantle. Reflectors are provided of the same height and substantially the same shape as those used for electric lamps.

Cold air enters at the openings shown and is heated before passing into the mixing tube. This arrangement with the unobstructed path provided for the products of combustion insures good draught and perfect combustion. Since the air chamber is entirely inclosed and the intake openings below the vents, the intake air is free from contamination by the vent gases.

This burner will give about the same candle power as a 60-watt lamp, and it can be used with a 25 or 40-watt lamp without affecting the symmetry of the fixture. It is well suited for brackets, or pendants where a by-pass is not desired.

A modification of this burner (Fig. 7), has the by-pass cock, pilot tube and gas regulating valve concealed within the burner body or casing and all adjusting parts accessible. This design gives a self-lighting burner of practically the same size and shape as the usual form of casing inclosing an electric socket, and which takes a reflector or globe harmonizing with the electric glassware on units of about the same candle-power. Like the 60 and 100-watt lamps it takes a reflector having a 2¼-inch fitter. On account of its small holder and low mantle position, this burner intercepts a very small zone of light; whereas a great many inverted lamps have the mantles so high and the holder so large that a great deal of the light flux of the upper hemisphere is absorbed; see Fig. 8.

There is no air regulator with these burners. The majority of users of mantle burners know very little about adjusting them. Two adjusting members (air supply and the gas supply) are rather confusing and frequently the air supply is cut off when it should be opened. With the air opening fixed and only one adjusting button it becomes a simple matter for even the inexperienced to adjust the gas supply to give maximum light.

A few illustrations are shown of this burner mounted on combination fixtures. Fig. 9 shows a rather plain fixture illustrating how well the gas unit harmonizes both in size and in outline with the general design.

Fig. 10 indicates the adaptability of the burner to a fixture of more elaborate style. It indicates how readily the treatment can be varied to suit architectural conditions or individual tastes.

Figs. 11 and 12 are designs of the cluster type. These fixtures, as well as the others shown, have the same light giving capacity with either illuminant

The semi-indirect fixture, Fig. 14, has an electric opal bowl and three upright mantle burners with internal pilot tips. The gas reflectors used are of a commercial type and harmonize quite well with the electric dish. The pilot flame, being in the center of the mantle, is protected from air currents and is very reliable in operation. The burners consume about 1¼ cubic feet of gas per hour each and give a light equivalent to that of about 175 watts of electric energy.

It is obvious that the use of well designed fixtures affording dual service has its advantages over either service separately. While electric service during the summer is desirable, both for fan service and intermittent lighting for short periods, gas service for the winter months when good lighting is needed for longer hours, is more desirable.

Figs. 15 and 16 are given as types of fixtures which lend themselves very readily to the use of combination units, without affecting their artistic elements.

[Official Report.—Continued from Page 230.]

FORTY-FOURTH MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

First Day—Afternoon Session.

The Association reassembled at 2:30 P.M., and President Hintze introduced Professor Woodbridge, who gave an illustrated talk on some of the principles of flame structure, and, by means of tables and charts, showed how the amount of heat necessary to move a given volume of air for ventilation can be calculated.

Discussion.

The President—We have listened to a very instructive address, and the members will have an opportunity to now ask the Professor any questions they desire.

The Secretary—I have a letter in connection with this which if it is your pleasure I might read. It is headed "The Ventilation of the Jamaica[1] Office Building, Brooklyn, N. Y.," is addressed to the Secretary, and is as follows:

"Your communication of February 5th, addressed to Mr. J. H. Jourdan, relative to ventilation of gas lighted and heated rooms, has been referred to me. We thank you for your kind invitation to attend the meeting of your Association, but find that it will be impossible for us to do so.

"Prof. Woodbridge designed the ventilating system for our newly completed Jamaica office building, a picture of which I am enclosing. This building is about 60 feet by 50 feet, inside measurement, and 55 feet 3 inches high, from basement floor to third floor ceiling.

"It is entirely lighted by gas, and the ventilating system was installed, running from all of the ceiling lights in the basement, and on the first and second floors. The third floor was purposely left unventilated, as we wished to make comparisons to determine the efficiency of the ventilating system; and, if found desirable, it would be very easy to install the ventilating system on the third floor at a future date, the construction of the building readily permitting it.

"Horizontal sheet metal ducts run from the lights to main ducts running along the wall at the junction of the wall and the ceiling, which main ducts then open into vertical ducts, or chimneys, rising above the roof. The horizontal collecting ducts are concealed by the

1. The Jamaica Gas Light Company is a subsidiary of the Brooklyn Union Gas Company.—Eds.

hanging ceiling, and the main ducts are concealed by a large cornice. The ducts vary in size, the collecting ducts generally running from 20 to 40 square inches, the main ducts in some cases being 112 square inches, while the vertical ducts range from 100 to 300 square inches. We have no definite data regarding the operation of this ventilation system; but it *does* ventilate, and seems to work satisfactorily. Men located in this building state that the air is at all times fresh and good. We waited some time after this building was put into commission for the force to settle down before we investigated the workings of the ventilating system. A short time ago a committee was appointed to look into the matter and determine what results we were getting. We expect to go into the matter exhaustively, making a complete investigation of the whole question. This investigation, of course, will extend over a considerable period. I trust that the above information will be of some value to you, and, if I can be of any further service, kindly advise me.—J. H. JOURDAN, Engineer."

The photograph is a photograph of the exterior of the building, so it does not really show the points brought out.

The President—Would any members like to ask the Professor any questions in regard to this?

On motion of Mr. Morrison, the Association passed a vote of thanks to Professor Woodbridge for the lecture.

The President—It gives me pleasure to extend to you the thanks of the Association. Are the Committees on Resolutions as to the deaths of Mr. John A. Coffin and Mr. Charles F. Prichard ready to report?

Mr. Barnes—On behalf of the committee appointed to prepare a memorial to Mr. Charles F. Prichard, I desire to state that, contrary to the usual practice of committees, the Chairman has not done all the work. He has prepared the memorial, but has asked me to read it, so I shine by a reflected light. I trust that the credit due for the preparation of the memorial will not lack in lustre by my attempt to read it.

MEMORIAL ON THE DEATH OF CHARLES F. PRICHARD.

It is not unusual at these meetings to miss the face of a friend and we are accustomed to hearing that death has come during the year past. Yet, although we say we are accustomed to such partings, there are some deaths which bring to the survivors a peculiar sense of loss, not only to the more familiar friends, but also to the whole, wide, circle of an Association like ours, whose interests and ambitions are allied to those of the member who is gone.

Such a death was that of Mr. Charles Florence Prichard, at his home in Lynn, of angina pectoris, January 21, whose going removed from this region most intimately connected with his activity an alert mind, a valued counsellor, a genial comrade and an experienced authority.

Born in Marblehead, June 10, 1856, 57 years ago, his boyhood was spent in that picturesque and interesting spot, then a quiet village, visited only occasionally by tourists. His reminiscences of Marblehead and "The Neck," which was then mostly pasture land, were numerous and entertaining, and he appreciated the good fortune which led him to spend the last 31 years of his life near the scenes of his early recollections.

He was graduated from the Institute of Technology, in 1876, when 20 years old, and seems to have made up his mind almost immediately to enter the gas business. He went to Worcester, soon after graduation, in the employ of the Worcester Gas Company. In a short time he went to Pontiac, Mich., thence to Dedham, Mass. While he was at Dedham he was appointed Superintendent of the Lynn Gas and Electric Company, and entered upon his work there in 1883, becoming also Vice-President in 1909.

Under his management it has become the largest lighting company in this State, with the two exceptions of the Boston Consolidated Gas Company and the Edison Electric Illuminating Company, of Boston. Everything now in Lynn in gas and electric plants is a testimony of his knowledge and efficiency. His standing in our profession was made evident by the reputation which he acquired, by the frequency with which his advice was sought and by the prominent part he took in all the Gas Associations. He was a director in several gas light companies in Massachusetts; had been President of the New England Association of Gas Engineers, of the Guild of Gas Managers, and of the American Gas Light Association, before which he read many papers and helped in many discussions, and became President of the American Gas Institute, presiding at its Detroit meeting, in 1909.

But he was not only the man of business. He was an excellent citizen; a factor in the social life of the city where he was loved and is mourned; and he was the best of companions, hospitable and generous, with a rare combination of gentleness, common sense, decision and humor.

His philosophical, patient and persevering study of problems confronting him, and his sincerity in stating his opinions won the respect of his business acquaintances, while his sunny greeting and his thoughtfulness endeared him to those who knew him well, as is made manifest by their sorrow at his loss, which is greater than they can express.

SAMUEL J. FOWLER,
ALBERT M. BARNES, } Committee.

On motion of Mr. Nettleton, seconded by Mr. Africa, the memorial was ordered accepted, to be spread in full on the minutes, and a copy thereof sent to Mrs. Prichard.

The President introduced Dr. J. F. Wing, who read the following paper on the

CHEMICAL AND PHYSICAL PROPERTIES OF LUBRICANTS.

Lubricants are used with moving machinery that the parts may be moved without much friction, which means loss of power, and which can easily increase to a limit where they cannot be moved at all, if the parts are well fitted. When smooth steel is at rest on cast iron, it requires a pull of about $\frac{3}{10}$ of its weight to move it. When one is moving on the other, about $\frac{2}{10}$ of its weight overcomes the friction and keeps it moving. We interpose a lubricant between these bodies because it forms a film with a friction approaching that of a liquid, and so greatly reduces the friction to possibly $\frac{3}{100}$ of the weight.

It is commonly estimated that $\frac{1}{10}$ of the power to run machinery is expended in overcoming friction. Now if it is more than this, say $\frac{11}{100}$, and can be reduced to $\frac{7}{100}$, saving 8 per cent., we have a field for the refinements of lubricants. The fuel and labor cost of steam for power at Everett is $40,000 a year. One per cent. of this (about $450) pays for the lubricants. In most plants the relative cost of lubricants is trifling. If the lubrication is not very efficient, it would be economical to pay more—twice as much—for material and testing, to save several times that amount in the cost of power. There are three classes of lubricants, referred to their chemical composition:

Those derived from mineral oils; those derived from animal and vegetable oils: those solid ones derived from mineral sources.

These are used sometimes separately, sometimes mixed. Any oil, if free from objectionable accidental impurities, may lubricate well, whatever the chemical composition of its base, but its value as a practical lubricant for various uses is not so general.

A clean mineral oil, of the ordinary series of hydrocarbons, which has been heated enough to drive off the dangerous vapors, but not enough to crack it, is not decomposed by anything that may happen to it below a very high heat, and hence will not leave in a steam cylinder or on a bearing any non-volatile product. This, then, is the ideal lubricating oil in respect to its composition, especially for steam cylinders and where the condensed water is returned to the boiler.

Any oil not filling these requirements of homogeneity and careful preparation, and is not a mineral oil, may suffer degeneration when subjected to unfavorable and violent treatment—it may be the action of air at the ordinary temperature, or the action of steam in the cylinder at a high temperature. Most mineral oils do not conform to these requirements, and the whole question of lubricants is a search for the best available.

The mineral oils are mixtures of many similar substances of simple nature, and are inactive. The organic oils are composed of definite complex compounds, mostly glycerine and fatty acids. They are of all degrees of stability at ordinary temperatures; examples of the extremes are olive oil and linseed oil. The change in these is caused by oxidation on exposure to the air, and they are classed as non-drying and drying oils. The first, as lard oil, olive oil and sperm oil, are comparatively permanent and are good lubricants. The oils grading into the drying oils are also used for special purposes.

All these organic oils are susceptible to change, partly aided by constituents of natural origin, as you know by their becoming rancid. On this property is based the preparation of "blown oils," as when air is blown through cotton seed oil at a moderately high temperature (175° F.) to thicken it. Then it is mixed with cheaper mineral oil for use with heavy machinery.

The fatty oils are non volatile, as are also their products of decomposition. The products are also insoluble in water, acid in nature, slightly corrosive, and form a very objectionable mass with lime when returned to the boiler. A grease may be a soft natural fat, or one of many mixtures of fats or oils partly changed to a soap by

caustic soda or limewater. Then, there are greases made of almost anything that is fine and smooth. Their chemical composition is not very significant compared to their physical properties.

The solid lubricants are indifferent chemically, under the conditions of use, on heavy and hot bearings. They need to be fine and unctuous. An oil must naturally be free from dirt and grit, and this is the only standard regarded by most users.

An oil which has any acidity is objectionable. Mineral oils, which have been refined with vitriol and washed to a "no acid" reaction; always contain sulphur compounds, which, on keeping and heating, become acid. When an organic oil is freshly manufactured, it may be free from acids, but it may appear in time. Then we have the gumming on the bearings, which is due to the oil acid acting on the metal and forming soap.

The formation of free acid in the steam cylinders by the action of steam has already been mentioned. This is also attended by corrosion and gumming. Mineral oil will dissolve this soap and clean the cylinder in time, and in a mixed oil will greatly hinder the decomposition. Of the two, mineral oils are better for hot rubbing surfaces.

The chemical composition of a pure oil will disclose this liability to decomposition, but it is not the important standard of its value for lubrication. A knowledge of its chemistry guides to its identification and the detection of impurities; for an oil dealer may make a mistake.

The best of lubricants for every purpose, from watch oil to grease for shafting, may be manufactured from petroleum, and the chemical composition of all is nearly the same. The suitability must be judged by its physical propertiez. The color is of little importance in the case of many oils, and may be any color in the mineral oils. The odor should be slight, even when warm. If otherwise, something is wrong. The engineer's practice of tasting oil is sensible and helpful.

The specific gravity is uncertain as a guide to its selection for a special purpose. The viscosity or rate of flow is not entirely decisive. It changes greatly with the temperature, and, when determined at the temperature at which the oil will be used, it gives no measure of its endurance as a lubricant. The viscosity is merely an indication that the oil has the consistency suited to the light or heavy work intended. This is the most decisive physical test we have, and that does not insure very much. The viscosity of all samples of the same fatty oil is practically constant, at the same temperature. A new lot, if not adulterated, will be like the former lot.

With mineral oils there is no such certainty, and if the viscosity test is the same, there is no certainty that the lubricating value will be equal. The only way to obtain a measure of its friction-reducing quality and endurance is the practical one of using a testing machine, which can be adjusted to the pressure, temperature and speed of the machine part on which it will be used, and, if a cylinder oil, in an atmosphere of steam.

This is better than trying it on machinery, because there one cannot measure the power consumed by friction definitely, and can only judge a change of temperature. To learn this requires quite a long time, and it is risky to experiment. Most testing machines have been built with a shaft running in a bearing; in these there is some question of the nicety of contact. I have seen the description of a machine in which the rubbing surfaces are revolving discs. Here the surfaces are always in contact, even after wearing, and all the conditions of the test may be applied. That lubricant is the most economical which, being otherwise unobjectionable, has enough body to keep the surfaces from coming in contact, under the highest pressure expected, and which has the greatest fluidity consistent with this requirement, and the least friction.

When a machine increases from a moderato speed and pressure, both variables raise the temperature, and much more of the original oil is needed, or the same quantity of an oil suited to the new conditions. Sometimes when a bearing becomes hot, any quantity of the ordinary oil will not help it, but cylinder oil or grease will. The ordinary oil is thinned so much it is carried by the contact of the surfaces. Thus refinement may be carried as far as you like; every dissimilar part of an engine or machine is served best by a different oil.

There is more certainty of lubrication in substituting thicker oils for thin ones, and by replacing oil with grease. There are both advantages and disadvantages in this practice of using grease. The cost of material and application is less; the drip and dirtiness are less. Journals will work more uniformly cool, and the danger from fire is less.

In general, the greater the consistency of a lubricant, the greater its endurance and economy of material, but this substitution leads always to loss of power by increased friction. The loss is seldom noticed or measured, and is not at all balanced by reduced cost, but it may be by other factors. Heavy, slow-running machinery is best treated with grease.

Discussion.

The President—We have listened with pleasure to the Doctor's paper, and I hope there will be a good, open discussion of it.

Mr. C. A. Learned—I would like to ask the Doctor a question, which refers however to a specific kind of grease; but without mentioning the company's name, I will make a general description to see if he wishes to answer it specifically. There is a sort of yellow grease upon the market which has been used very extensively, that has a certain copyright name, and I wished to ask if he has tested that particular kind of grease and found it applicable in many ways for lubricating purposes.

Dr. Wing—One grease has more consistency than another. You have either to learn by experience or take the judgment of the dealer. That is about all you can do without using a testing mechine. I am sure no one grease is applicable to a very general line of application.

Mr. Norcross—Has Dr. Wing's investigations convinced him that oils of exactly similar character, and suitable for similar purposes, are sold anywhere from 15 cents to 65 cents a gallon, according to whether the customer is willing to pay it or not. That has seemed to me to be the situation as regards lubricating oils.

Dr. Wing—The situation generally is a good deal like that. (Laughter). If you do pay more you are more apt to get a better lubricant. Although you may pay for the name, you do have to know something from a physical test. I will say frankly I never have used a testing machine, in which respect the paper is considerably academic; but commonsense would lead anyone to think that is the only way to keep a control on the material you are buying. The best oil that we ever did use, and it stood all chemical tests for impurities, was the highest priced one we ever bought, although we now buy 16 or 17 cent oil, and we probably have paid much more than others were worth.

Mr. Miller—Will Dr. Wing please tell us if he knows about any testing machine for an oil for use in an internal combustion engine?

Dr. Wing—The testing machine of which I saw a description tests oils for that purpose. It has a dry heated cylinder where friction can be measured, and the effect of the oil, at different reasonable and practicable temperatures, is noted. It carries out the really practical test of a steam cylinder. You can heat it as high as you please, to correspond with superheated steam, and then it can be opened and examined for decomposition of the oil and for gumming or settling on the parts of the machine.

Mr. Otten—Has the Doctor made any tests on graphite and grease?

Dr. Wing—I said a moment ago that I had not had a testing machine.

Mr. Otten—Have you used graphite in the same apparatus, and have you noted any difference just from observations?

Dr. Wing—Yes; I have used graphite in bearings, and used it with satisfaction as far as noting that the bearings will stay cool; but where you have only that sensible feeling that it is running right you have no measure at all of the extra power consumed, using that lubricant. The friction may be immensely more than the suitable oil to give the fluid friction.

Mr. Morrison—If the Doctor had two oils, one of which was greater in viscosity and had a higher flashpoint than the other, which would he prefer?

Dr. Wing—The oil should be selected that is suitable to give a liquid film in the bearing; for instance, under the practical pressure, speed and temperature. This oil, having a higher viscosity than the other, should be tested at the temperature of the machinery, and then the friction should be tested at the same temperature. Viscosity alone is a very uncertain guide; in fact, it is only an indication. If it is taken at a low temperature you don't know at all what it would be at 100° F., or 300° F. The viscosity of an oil which is to be used at a moderately warm temperature, should be tested at that temperature, in which way you should get a line on what it is actually in use. Viscosity changes rapidly.

Mr. Bird—What was the temperature with speed at which the 17 cent oil was used.

Dr. Wing—We use this machine oil for motors and other light, fast-running apparatus; also, for heavy, positive blowers, running

up to 180 revolutions. The temperatures are atmospheric, except for the heat from the bearing, sometimes rising higher than 150°.

Mr. Hamilton—I would ask Dr. Wing if he thinks it possible to check up different shipments of oil of the same general quality by a few chemical or physical tests, for viscosity, specific gravity, flash or firepoint, and then by its general appearance.

Dr. Wing—I don't think you can, except as I remarked in the paper on organic oils, which are really unchanging at the same temperature. All mineral oils have such an infinite variety of composition that the viscosity of one lot is difficult to duplicate, or if it happens to be the same it is impossible to say that the friction-reducing qualities will be the same in use. An organic oil of a definite composition will act the same always. A mineral oil is not definite, and it is difficult to duplicate any lot; therefore, to be certain, a testing machine must be used.

Mr. Wyant—As regards steam cylinder oil the character of the lubricator may have quite as much to do with the value of the lubricant as a difference in the latter. I had an amusing illustration of this recently, when an agent showed me a lubricator for which he was selling grease for lubricating steam cylinders. I was much interested in the lubricator. It seemed to me extremely good, because the oil was atomized as it entered the cylinder, and it appealed to me that this principle must necessarily count for economy in lubrication. The agent proposed an agreement regarding the use of his grease in these lubricators at a saving in cost of lubrication. Part of the agreement was that his company would loan all the lubricators you pleased, and furnish the grease at a definite (and high) figure, but that the lubricator should not be used with any other grease or oil. I told him I would be glad to buy a small quantity of his grease, without guarantee, but with the understanding that I might make a test of the lubribator on my own cylinder oil. The agent agreed to this, and I put on the lubricator and used the grease, and found the combination worked extremely well. After using it for a week on a new pump we examined the interior of the cylinder and found the lubrication had been perfect. We then cleaned out the cylinder thoroughly and substituted cylinder oil for the grease in the same lubricator. After a weeks' run, we found that the same quantity of cylinder oil also gave perfect lubrication, and that the quantity of cylinder oil or grease needed was not more than one-third the quantity required in the usual types of lubricators. I think the experiment indicates the value that the form of lubricator may have in the use of any sort of oil or grease. Later on I tried to buy some of the lubricators, but the owner of the patents would not sell them and thought we ought to be content with cheaper lubrication, regardless of the cost of grease.

On motion of Mr. Crafts a vote of thanks was given Dr. Wing for his paper.

The President introduced Mr. E. R. Hamilton (Lowell, Mass.), who read the following paper giving

DATA ON THE INFLUENCE OF COPPER ON THE CORROSION OF IRON AND STEEL.

The Providence (R. I.) Gas Company has saved, at different times, short sections of old service pipes that have been badly corroded, or that have resisted corrosion unusually well. From a large collection of these pipes 5 specimens were selected which represented, in a general way, the least and most corroded of the pipes. With one exception these pipes were removed during 1911. As far as possible, the time at which the pipes were laid and the character of the soil have been ascertained. These facts are given in the table below, together with the chemical analyses of borings taken from the different pipes.

Pipe.	1.	2.	3.	4.	5.
Laid	1870	1856	1867	....	1856
Removed	1911	1911	1911	1911	1906
Soil	Clay	Clay and gravel	Gravel	Gravel	Sand and gravel
Carbon	0.102	0.098	0.042	0.035	0.013
Sulphur	0.022	0.027	0.035	0.027	0.023
Phosphorus	0.159	0.175	0.251	0.161	0.165
Silicon	0.197	0.157	0.216	0.141	....
Manganese	0.030	0.053	0.029	0.025	0.065
Copper	0.051	0.036	0.215	0.024	0.030

It will be noticed that all these pipes have been in the ground over 40 years. Although the exact date of the laying of pipe No. 4 has not been ascertained, records show that it has been in use over 50 years. Pipe No. 5 was destroyed by electrolysis, produced by stray currents from the street railway tracks. The amount of phosphorus in all these pipes is high, No. 3 showing a particularly large percentage. Nos. 5 and 2 show the greatest amount of manganese. Pipe No. 3 contains about the same as pipes Nos. 1 and 4. It is to be noted that all these pipes contain copper, and that No. 3 contains over ¼ of 1 per cent.

Fig. 1.

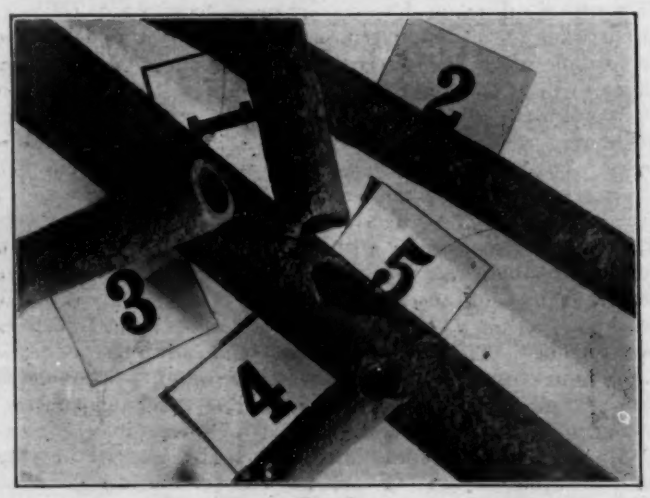


Fig. 2.

GROUPS OF THE OLD WROUGHT IRON SERVICE PIPE.

Pipe Fo. 1.—From 34 Elbow Street, clay soil, service laid 1870.

Pipe No. 2.—From 11 Benefit Street, blue clay and gravel, service laid 1856.

Pipe No. 3.—From 203-204 Federal Street, gravel soil, service laid May 5, 1867.

Pipe No. 4.—From 82 Vernon Street, gravel soil, pipe taken out at entering point to wall, service over 50 years old.

Pipe No. 5.—From Central Baptist Church, Weybosset Street, destroyed by electrolysis, Dec. 11, 1906, service laid July 7, 1856, 3 feet cover, soil sandy.

To show the character of the corrosion and the thickness of the pipe walls photographs were taken, and are here reproduced. Pipes Nos. 3 and 5 have retained very nearly the original thickness of the walls, while pipe No. 4 has been eaten away so that the end may be broken easily with the fingers. To determine if there was any apparent difference in the structure of the various pipes, cross sections were made, and, in the case of pipe No. 3, a longitudinal section was also made. The surfaces were polished and etched with picric acid. As shown in the accompanying micro-photographs, no apparent difference was found in the structure of any of the pipes, while in all cases the amount of slag is particularly noticeable.

The remarkable state of preservation of pipe No. 3, and the large amount of copper it contained, made it seem advisable to carry on further investigations. Interest in this matter was further accelerated by the discussions, at the time, of the effect of copper on the preservation of the Newburyport chain bridge.

Samples of new, wrought iron pipe were subjected to a series of tests, together with two samples of copper steel and one of Normal steel received from the Riter-Conley Company. Analyses of these steels and of the wrought iron pipes are given, and it is interesting to note that the sample of normal steel submitted for comparison with the copper steel contains over 0.15 per cent. copper.

Fig. 3.

Polished cross section of No. 1 pipe, showing uneven slag distribution and slag structure. Magnification, 51 diam.

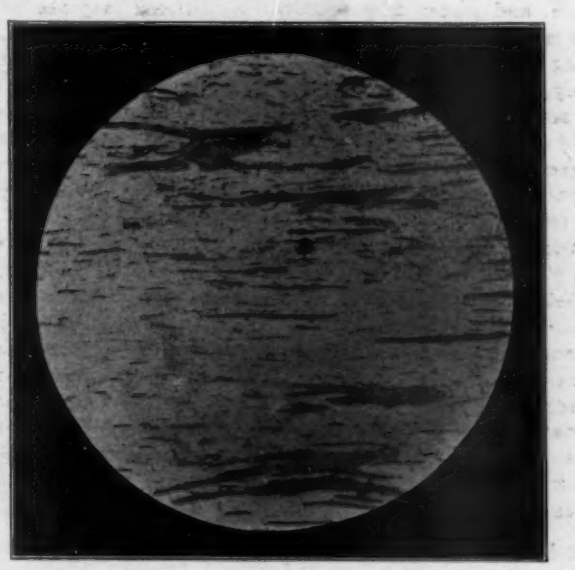


Fig. 4.

Longitudinal section of No. 3 pipe, showing drawn out masses of slag. Magnification, 51 diam.

Fig. 5.

Cross section of No. 5 wrought iron pipe, showing general structure characteristic of all wrought iron pipe examined. Magnification, 123 diam.

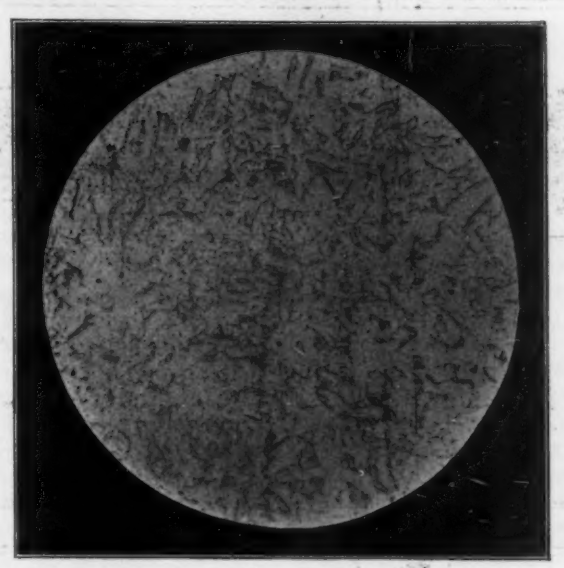


Fig. 6.

Section from test piece from Allegheny holder tank. Magnification, 82 diam.

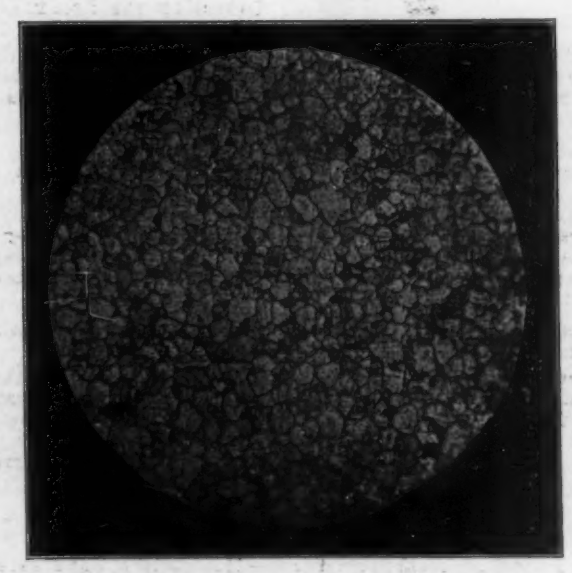


Fig. 7.

Sheet copper steel received from Riter-Conley Co., for testing of new works. Magnification, 230 diam.

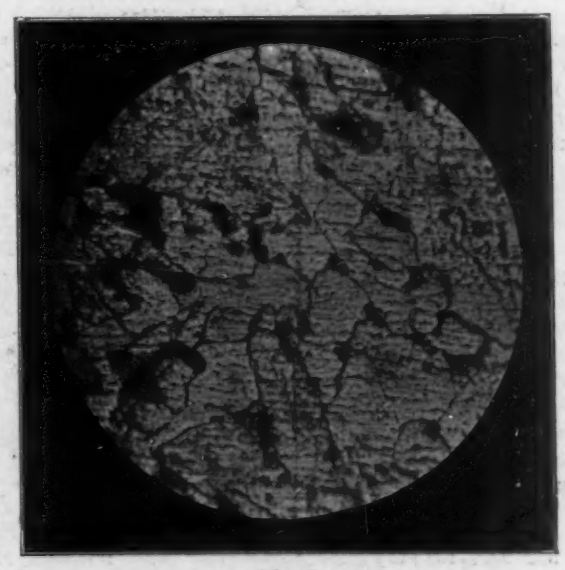


Fig. 8.

Section of copper steel pipe received from Riter-Conley Co., for testing. Magnification, 230 diam.

(*Continued on page* 250.)

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NEW YORK, MONDAY, APRIL 20, 1914.

[Official Notice.]

Sixth Annual Meeting, Southern Gas Association.

Southern Gas Association,
Office of the Secretary,
Atlanta, Ga., April 3, 1914.

To the Members of the Southern Gas Association: The sixth annual meeting of the Southern Gas Association will be held at Mobile, Ala., April 22, 23 and 24, 1914. The following papers will be read and discussed:

"Public Utility Policy," by H. M. Moore.
"Construction and Operation of a Modern Gas Plant in a Small Town," by C. M. Crawford.
"Equitable Gas Rates," by S. E. DeFreese.
"Practical Gas Lighting," by E. M. Osbourne.
"The Industrial Position of Artificial Gas," by Mr. Lansley.
A paper, by Mr. Roehmer, of the Wisconsin State Commission on a subject not yet announced.

Respecting hotel information and entertainment programme, separate notification has been made.

There will be no reduction in railroad rates, except to those who buy railroad tickets at same station in Alabama. A 3 cent round-trip rate will prevail in Alabama, provided the round-trip ticket is purchased on April 19, 20 or 21. All gas men are welcome.

E. D. Brewer, Secretary.

BRIEFLY TOLD.

The Finish at Allentown, Pa.—'Tis quite a hark back to the finish of the annual meeting of the Pennsylvania Association, but that the record may be kept intact, here is the story—the closing chapter is dated the 10th inst.: At the banquet last night we had everything, except dull moments. When we entered the dining room the "Gas House Orchestra" (eight employees of the Allentown-Bethlehem Gas Company) were "rendering" good music, and 'twas only a few minutes thereafter we were seated, ready to receive Chief Clerk Fry, who led in the "Gas House Minstrel Troupe," comprising 21 other employees of the Company. With the orchestra, the blacks, or both, there was something doing or being done every minute. When the last line on the menu had been scanned, President Frick introduced Mr. E. H. Renninger, who acted as Toastmaster, and incidentally gave a very good short talk. President-elect L. R. Dutton spoke to the point, as he always does; District Attorney Rufe gave some good advice as to the conduct of gentlemen, and friend Valentine told some stories that evoked "laughs." Then the Olio programme was started, with an exhibition of magic, by Mr. Ed. Gehris; next the "Salesmans' Sketch," by Rudolph, Mager and Conrad, introducing our friends Millspaugh, Valentine, Fees, Grady, Young, McKinney, Belmuth, Peck and Danes. Then the Turkish lady, Mr. Burkholder, wiggled away amid great applause. The songs we sung were led by "Meeters," Charlie Miller and "Hutch.," and we didn't go home till morning.—Camp.

The last (or Friday morning) session came through at 10:20, and Mr. Stack read his very good paper on "New Business Methods." As part of the discussion Mr. Gaylord read the Brock-Conroy paper on "Free Maintenance," that was read at the last meeting of the New Jersey Gas Association. In discussing Mr. Stack's paper the related Short Topics, numbers 2, 3, 4 and 9, were included, and brought out some good points. President Frick here introduced Mr. W. H. Gartley, President, American Gas Institute, who brought greetings to this affiliated Association. Mr. Gartley indorsed Mr. Young's remarks as to the value of association work, and regretted that the affiliation plan had not been welcomed as it deserved, because of fear that it would eliminate individual society effort. The real value of affiliation was shown by the help the Institute had been able to give in guiding the commissions in the preparation of reasonable rules, and its influence with the Bureau of Standards in revising Circular No. 32. Each affiliated Society was given a representative on the Board of Directors of the Institute, and their help and suggestions were solicited on all questions. The Pennsylvania Association had not availed itself of this privilege, but it was hoped its representative would feel interest enough to attend the sessions of the Directors. As influencing the future of their business, the Institute had taken up, with the supervising architect, the matter of fully piping all government buildings, and found that even the electrical companies favored gas piping in all the larger structures, as a means of keeping out the individual electric plant; while gas heating facilities reduced the size of boiler installations. All large factory buildings, he said, should be piped, for these structures could be best and most economically lighted by gas. The Institute could help in such matters, and all similar problems should be put up to the National body. The Institute had the data of the researches of the Civic Federation on the inadequacy of municipal operation, and under new political conditions, they needed all these helps in dealing with even local questions. President Frick, in sug gesting a rising vote of thanks to Mr. Gartley, for his more than merely interesting talk, admitted that the Pennsylvania Association had not availed itself of its affiliation privileges, but promised it would do so. Mr. Hutchinson, as a member of the International Congress Committee of the Pacific Coast Gas Association, urged that everyone attend the Fair and the Congress. Round trip, all rail, rates from New York had been put at $100, with attractive prices on side trips; and the hotel men of San Francisco had formed an association pledged to not raise their charges during the Exposition. President-elect Dutton made announcement of the Committee appointments for the year, and Mr. Keppelman, for the Public Relations' Committee, asked that all the members consult with the body for assistance, and in turn to give it their help. Mr. Spragle moved an appreciation of the work of the Allentown gas men, respecting the entertainments furnished so lavishly, which Mr. Frick promised to deliver. The President thanked the Asseciation in the name of Allentown and the Allentown Company, and at 12:20, declared the convention adjourned.

Mr. Bond's Well Put Plea for Increased Efficiency in Application.—Mr. C. O. Bond, President of the Illuminating Engineering Society, in addressing the Pennsylvania Gas Association at its Allentown session, gave some very good advice. He said: While speaking to you as a representative of another society, I cannot forget that I am one of you and beg, therefore, to address you in part at least as one of yourselves. To each of us has been given control over a quantity of the earth's vanishing stored energy, and it should be the thought, next the business conscience of each, that while making a living by the proper release of this energy, we owe it to humanity to avoid waste in every way possible. The net efficiency with which we change coal from solid to gaseous energy, working up all the residuals, as compared with other forms of stored energy release, is so high as to give us justifiable pride. It is possible for us to deliver 55 per cent. of this energy at the meter of the consumer. There are those who argue that our work and responsibility end at that point, and there are many others whose interest is solely in increasing output. We can, however, add the value of accompanying service to our product, so that we deliver both and get paid for both; and we should not forget that service *is reproducible* as well as the money that is paid for it, while coal is not. Good service, resulting in express satisfaction from the consumer, leads to accept the further responsibility not only of the delivery of our product but of its proper utilization. When we utilize gas for heating, it is possible to get 100 per cent. efficiency, though conditions of ventilation reduce this in different degrees. When we utilize it for cooking, we get an efficiency of between 25 and 50 per cent.; and when we utilize it for power, we get an efficiency of between 30 and 35 per cent.; but when we utilize it for lighting, we get an efficiency of not over 1 per cent., based on its energy content and compared with the most efficient light thus far known. It becomes our grave duty, therefore, to make

this 1 per cent. as useful and effective as possible. We send experts to insure that a gas engine is delivering its rated power, and we send demonstrators to insure that the loaf is baked, or the chicken broiled with a minimum of worry and expense; but do we send a lighting expert in the same way to see that, in a room for instance with green-hued, wall finish, a red or pink globe does not surround the light source, or that children at their nightly study, over an execrable glazed paper, are not supplied with a flickering light or one whose 40 candles per square inch brightness has not been softened to 2 candles per square inch or less, by a diffusing shade or by diffuse reflection, or that sales folk and clerks are not provided with lights and reflectors which illuminate their own faces rather than the material on which they work? The art of illumination has long existed, but out of its unclassified endeavors the science of illumination is only now arising. The Illuminating Engineering Society sends cordial greetings to the Pennsylvania Gas Association and earnestly invites its members to add to their other methods of efficiency those which our Society promulgates.

CURRENT MENTION.—

We are indebted to the attention of Mr. Morris W. Stroud, President of the American Gas Company, of Philadelphia, for the following corrections respecting a noting, in our Current Mention of last week, to the effect that Mr. H. G. Williams, who had been the Company's manager at Pottstown, Pa., for a number of years, had been "promoted to the Superintendency of the entire Jenkintown division of the Philadelphia Suburban Gas Company." Mr. Williams has been made Manager of the Luzerne County (Pa.) Gas and Electric Company, with headquarters at Kingston, Pa. Mr. L. R. Dutton is Manager, the Jenkintown Division, Philadelphia Suburban Gas and Electric Company. Mr. T. E. Spence has succeeded Mr. Williams at Pottstown.

"A very pretty function was that which marked the 50th anniversary of the wedding of Dr. and Mrs. Jacob F. Spaulding, which was brought off at their home, Amesbury Road, Salisbury, Mass., the afternoon and evening of the 7th inst. Amongst the floral tokens was a massive one from the Amesbury Gas Company, of which corporation the Doctor is President.—R. Y. V."

At the municipal election, held early this month in Ypsilanti, Mich., the proposition to construct a gas plant, to be operated on municipal account, was rejected.

"Under the agreement between the authorities of Minneapolis, Minn., and the Minneapolis Gas Light Company, by means of which an end is put to a lengthy controversy over the gas rate to obtain in that city, the schedule is to be: From April 1, 1914, to January 1, 1916, 80 cents per 1,000; from January 1, 1916, to November 1, 1918, 77 cents per 1,000. It is further agreed upon that consumers who have paid for gas at the rate of 70 cents per 1,000, since the ordinance naming such figure went into effect last November, shall not be sued for the difference, and that all consumers who paid at the former 85 cent rate shall be given a rebate of 15 cents per 1,000 on all bills paid at that rate. It is further stipulated that the Company may reduce the candle value from 18 to 15, provided the heating value is not reduced to less than 600 B.T.U. per cubic foot.—D. R. M."

The Gas Machinery Company, of Cleveland, O., has been appointed exclusive agent for the "Perfection" gas regulator for all States east of, and including North and South Dakota, Nebraska, Kansas, Oklahoma and Texas. This regulator, which is very well-known on the Pacific Coast, has been subjected to very severe tests by gas engineers, and although the regulator has been on the market on the Pacific Coast for a comparatively short time, during the first 10 months of 1913, orders were received for the State of California alone for 26,000 of them. This device is described in The Machinery Company's Bulletin, No. 376.

Announcement is made of the incorporation of the Carrabassett Light and Power Company, the purpose of which is to "Own, control, develop and operate water powers for general purposes, to generate and supply gas and electricity for the towns of Anson, Embden and New Portland, and for many other general purposes." It is capitalized in $50,000, $25,000 of which is preferred. The officers of the concern are: President, George H. Hinckley; Treasurer, J. Frank Connor; Clerk, Benj. G. Ward, all residents of Portland, Me.

[Concluded from page 248]

PANAMA-PACIFIC INTERNATIONAL EXPOSITION'S SYSTEM OF HEATING AND LIGHTING BY GAS. SCIENTIFIC SCHEME OF PIPING FOR HIGH PRESSURE DISTRIBUTION DESCRIBED IN DETAIL.

By Mr. Guy R. Kinsley.

In the matter of measuring the gas supply for the Exposition two of the latest types of meters will be used, and scientific men will be able to watch this apparatus in an unusual test. Two Thomas electric-gas meters will be used to record the flow of high pressure gas. The gas that passes through the meter is heated by means of an electric current, and a careful measurement of the quantity of electricity employed with the rise in temperature of the gas, supplies the factor for determining the exact quantity of gas measured. The gas that will be used is made from the California crude petroleum, by a process which is itself Californian. It is produced from the oil with practically no by-products, is remarkably free from sulphur and other impurities. Its illuminating value is about 19 candles, and it has a heating value always in excess of 600 B. T. U. per cubic foot. It is expected to provide an ideal fuel for heating, cooking, illuminating, and all other purposes, within the Fair grounds, coupled with convenience and safety, which are not enjoyed when solids or liquid fuels are used. A part of the exposition lighting system will in fact be an exhibition of high pressure gas lamps which will be used on a large scale in this country for the first time. They will be placed in the section of the grounds occupied by the State and foreign pavilions and on the concession streets. They will stand on a bronze upright and will be attractive even when not lighted. In the Court of Abundance gas will have its greatest part in the spectacular features of the earth, and the history of man in symbol will be presented. Here the high pressure gas will be used in great, flaring, flambeaux, surrounding the lagoon in the center and lined against the fireproof walls of the court. By the use of minerals distributed in the path of the gas varied colors will be created to cast their spell on the splendor of the scene. But, important to the Exposition and to the scientific world as these uses of gas are to be, its use in heating promises to excel all others. "Surface combustion," something new in the scientific world, has never been given extensive use, but if the plans of the Exposition are consummated this development of the use of gas will be given a complete test which will advertise its merits to the world as no other means could do. Surface combustion is the use of heat from gas without flame. The distinguishing and essential feature of this process is that a homogeneous, explosive, mixture of gas and air, in the proper proportions for complete combustion, is caused to burn without flame in contact with a granular incandescent solid, whereby a large proportion of the potential energy of gas is immediately converted into radiant form. The advantages of the new system, which the Exposition test should fully determine, are that the combustion is greatly accelerated by the incandescent surface, and may be concentrated where the heat is desired; the combustion is perfect with a minimum excess of air; high temperatures are possible without the aid of elaborate regenerative devices; and, as a matter of economy, the originators claim for it twice the heat with half the cost. If the Exposition agrees to install the latest device for utilizing heat from gas it will mean that every stove on the concession ground, the heating for buildings (except possibly the service building) and all the cooking will be done by this radiant heat of "surface combustion." The Exposition gas expert is now preparing a design of heater which will be used with the idea of "surface combustion," in case it is ultimately agreed upon. Instead of requiring expensive apparatus for the various concessionaires, he will have hundreds of "stoves" built which will have a very nominal cost, and if these are not purchased he will make contracts on behalf of the Exposition whereby they are to be rented to concessionaires at a very moderate rate. Here will be another utility, which will be in the nature of the most interesting exhibit to the gas men of the world, and especially to the scientists who first conceived the idea of "surface combustion." The radiant heaters will also be installed in the Palace of Fine Arts and the Festival Hall. The gas expert will embody his own ideas of heating in these devices and will use what he calls "psychological heating." By the use of a polished background, fashioned into a parabola, he will have the heat radiated from many parts of the halls, and a very small volume will be sufficent, as tests in the now completed buildings have shown him. Experiments with stoves, colored to appear red hot, have demonstrated to him that warmth is also a condition somewhat dependent on the mind, and by this parabola the appearance of the heat glow will be many times enlarged, and the radiant heat, when within range, will be enhanced. By his type of commercial radiant heater, the heat waves may be directed in any manner desired, and all will be built some distance off the floor, and may be even suspended from the ceilings or walls, wherever they will serve the greatest number of persons. In the heaters to be used for cooking there will be one great difference from all the stoves hitherto designed to utilize the principle of "surface combustion." The Exposition stove will not have the fan, as the mixing of the gas will be accomplished without its use, due to a later idea. The operation will not only serve in the capacity of retailer of gas, with exceptional advantages aud conveniences in its use, but will also try to encourage and demonstrate the practical uses of "surface combustion." Gas will also be used for patrol purposes, and the grounds will be so well equipped with gas lighting that a complete suspension of electric power would leave the grounds well lighted. After the closing hours every day for the 10 months, gas will be used until daybreak. These are some of the things that the Exposition will do with gas, and the science that has been brought from the ends of the world, to get the most out of its power. The many exhibits in the great exhibit palaces, relating to manufacture and the various appliances for gas consumption, will add to the interest of the world's greatest exposition to the minds of men trained to gas problems and gas rewards.

(Continued from page 217.)

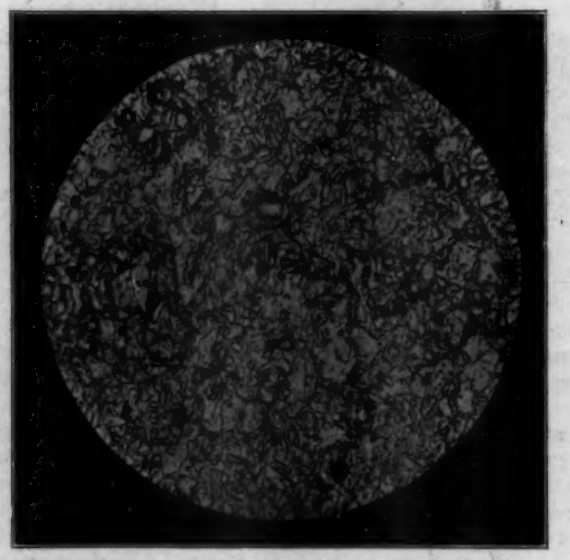


Fig. 9.

Sheet steel received from Riter-Conley Co., for comparison with copper steel. Magnification, 230 diam.

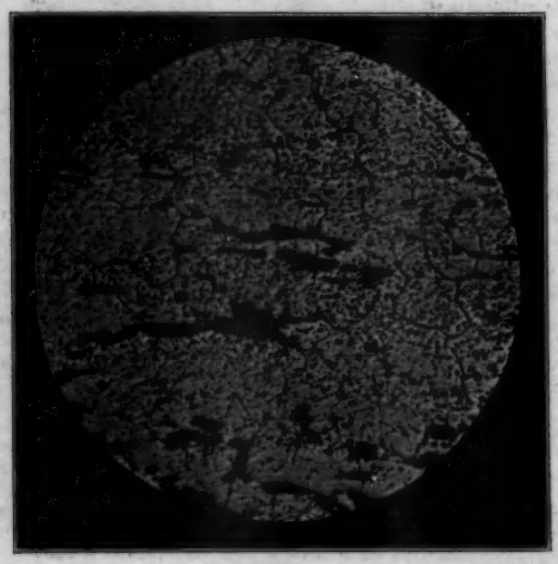


Fig. 10.

Wrought iron pipe, new, showing slag and ferrite crystals. Magnification, 124 diam.

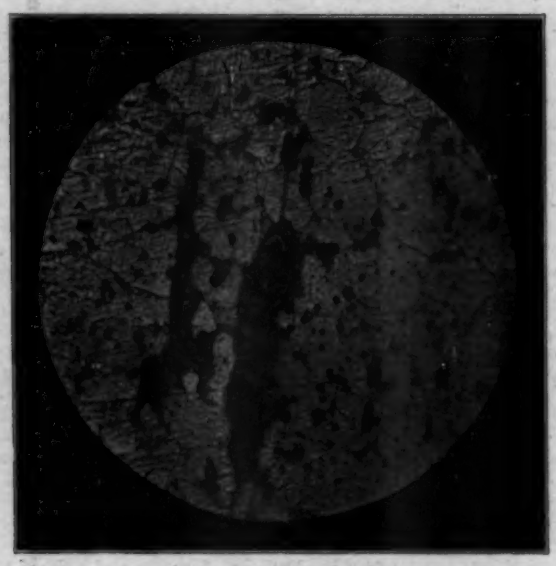


Fig. 11.

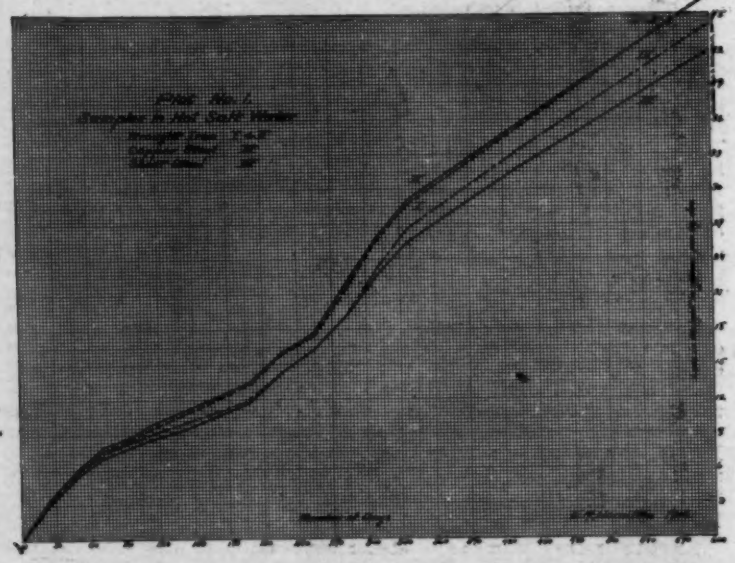
Wrought iron pipe submitted as steel pipe, new, showing slag structure. Magnification, 230 diam.

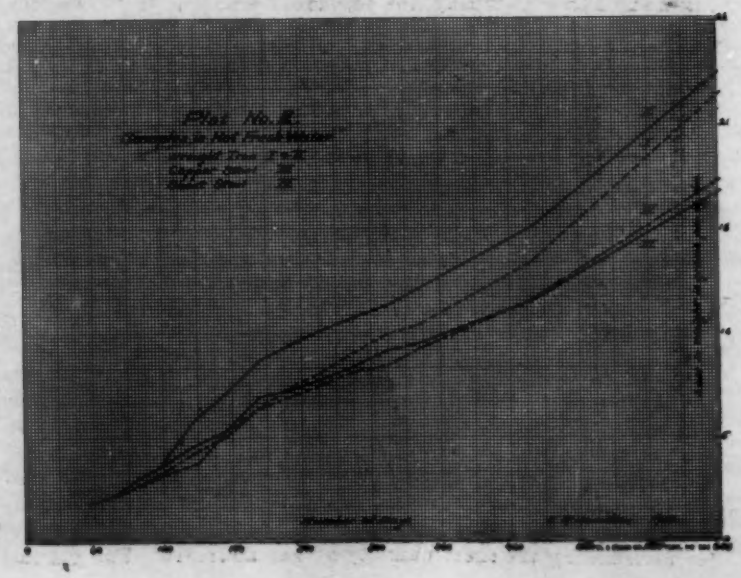
Micro-photographs of the different samples were made, and also of a test piece taken from the copper steel holder tank erected at Pittsburgh by the Riter-Conley Company. This test piece was analyzed for copper alone, and was found to contain 0.468 per cent. The entirely different structure of 3 specimens of copper steel is to be noted, and also the large amount of slag present in the wrought iron pipe. In this connection it may be remarked that one of the samples of wrought iron pipe was submitted as steel, but microscopic examination at once proved it otherwise.

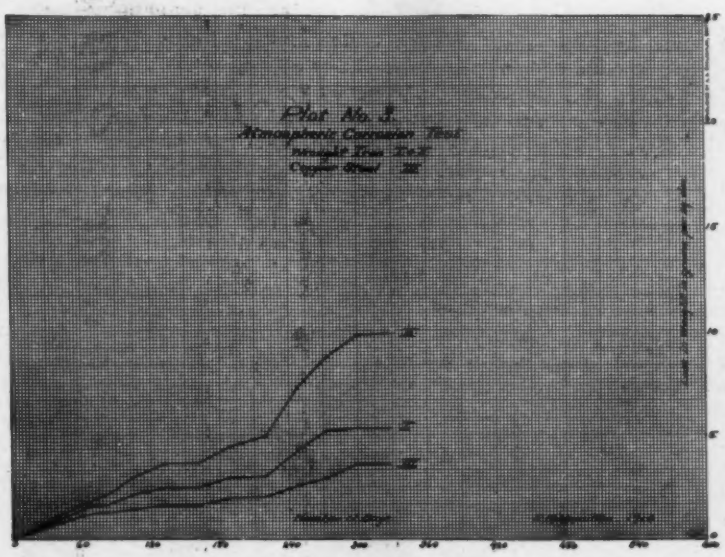
Description.	Carbon.	Sulphur.	Phosphorus.	Manganese.	Copper.
Wrought iron pipe, No. 1..	0.095	0.013	0.113	0.043	0.065
Wrought iron pipe, No. 2 .	0.105	0.038	0.119	0.028	0.045
Normal steel.....	0.112	0.074	0.048	0.321	0.162
Sheet cu. steel	0.060	0.036	0.008	0.240	0.645
Cu. steel pipe.....	0.092	0.034	0.070	0.275	0.774

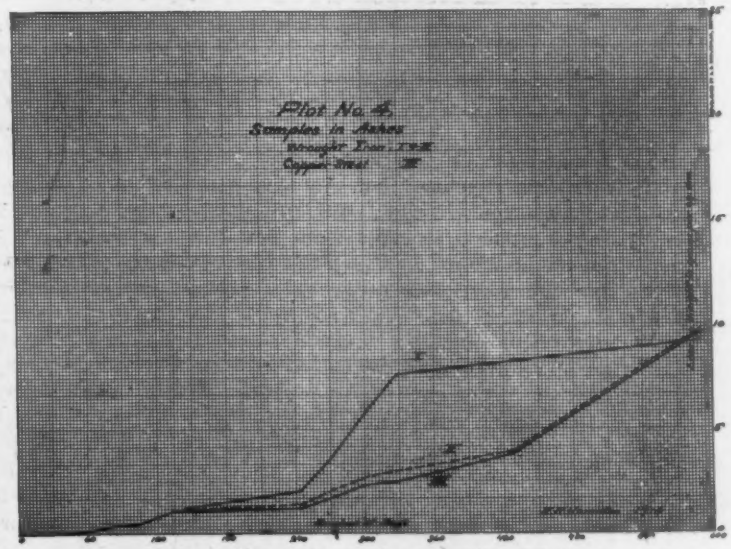
Specimens, approximately 5½ inches by 2 inches, were cut from the different samples, and, after removing any mill scale, were exposed to such conditions as are found in gas works. Periodically these samples were collected, oxide scale which had formed on the outside was removed by scraping and treating with ammoniacal ammonium citrate solution, and the loss of weight determined. For comparison the loss per unit area of original sample has been calculated, and is plotted against the time that the specimen was exposed. These plots show graphically the relative stability of the different specimens under the conditions in which they had been placed. In the reproduction of these plots they have been reduced to such an extent that some of the printing appears very small. I might state that the vertical co ordinate is less in grammes per square diameter, and the horizontal co-ordinate shows the number of days that the specimen was subjected to the condition under which it was placed.

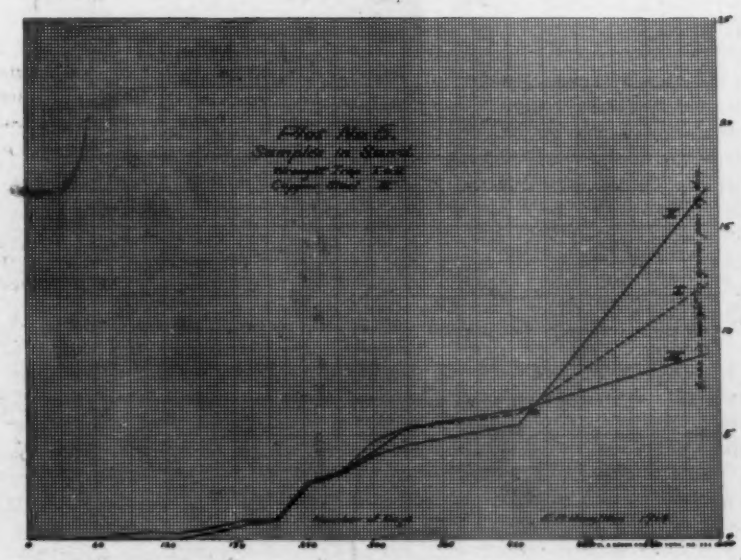
Plot No. 1 shows the results obtained from samples immersed in a hot salt water condenser, operating at about 160° F. Plot No. 2 shows results obtained from a similar set of specimens immersed in

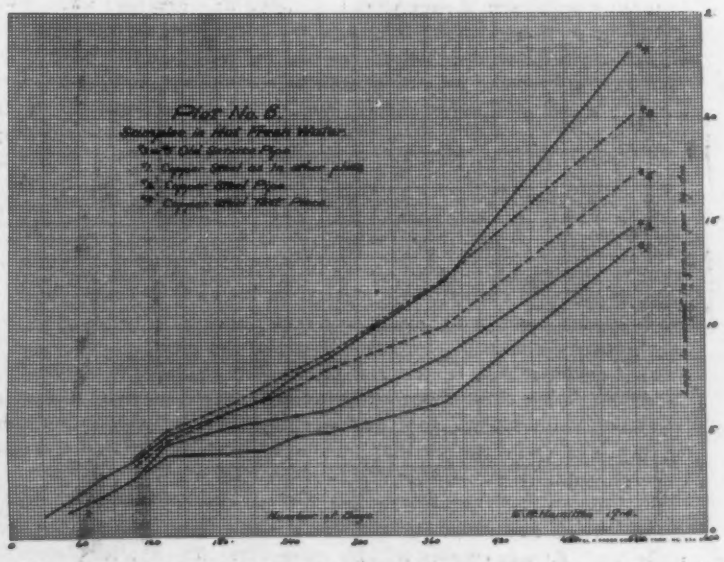












a fresh water condenser, operating at about 140° F. Plot No. 3 shows results obtained from 3 samples exposed to atmospheric conditions. Unfortunately these samples were lost after the 328th day, but the indications were very conclusive. Plots 4 and 5 show results obtained from samples buried in the ground. In the case of Plot No. 4 the specimens were buried in ashes, while in the case of Plot No. 5 they were buried in sand. Conditions in this latter case were somewhat disturbed by purifying material, stored on the ground above them during the latter part of the time. This accelerated the corrosion of these specimens, but is a feature of additional interest, as indicating the possibilities of the different metals under these conditions. To show more clearly any particular advantage of the old wrought iron service pipes over copper steel, specimens were cut from pipes No. 3 and No. 5 (these are the two that resisted corrosion particularly well), and were placed in the hot fresh water condenser, together with samples of three different copper steels. The results obtained from this test are given in Plot No. 6. With regard to these plots I might add they are all plotted on the same scale, with the exception of Plot No. 1. In that case the loss was so extremely high that I plotted the vertical co-ordinate to a different scale than the others. So that in all other cases these plots are comparative to one another.

The plots in all cases show results favorable to copper steel. In the case of the two sets of specimens immersed in the hot condenser water the normal steel gave results next best to the copper steel, but it is to be remembered that this contains 0.15 copper. The results obtained from the old service pipes would indicate that no better results may be expected from them than from the material produced to-day.

It appears from the data thus obtained that considerable advantage may be obtained in using copper steel where it will be exposed to ordinary atmospheric conditions or to the corrosive action of hot, brackish or fresh water.

Discussion.

The President—Mr. Hamilton, who is one of our younger members, has given us a very good paper. Mr. Carpenter, would you enlighten us a little on the further use of copper-steel?

Mr. Carpenter—I want to compliment Mr. Hamilton for the work he has given this paper, and if more research work of this nature could be accomplished by you, who are vitally interested in the use of steel, I believe great good would result. Copper steel should be of great value to gas companies, particularly in connection with their mains and services. For many years we have given careful consideration toward the possible elimination of rapid corrosion and pitting in rolled steel plates and sections. The protection of such steel structures as gasholders by painting has proven to be very expensive and in general impractical. Within the last two or three years, we have constructed gasholders exclusively of copper-steel, and the results in this direction have been very gratifying. A short time ago, in company with one of your members, I made a careful inspection of a large gasholder which had been in use for some months, all parts of which were made of basic, open-hearth steel, carrying ¼ of one per cent. copper. This entire structure had been painted with a transparent varnish, so that any discoloration or pitting of the steel underneath the paint would be visible. The varnish on the holder, which had worked in and out of the water, had practically disappeared. Occasionally we found a spot where the steel had discolored, but the discoloration in all cases was readily rubbed away by the finger, and the bright metal remained underneath with no tendency whatever toward pitting. This holder, I feel, gives a most favorable demonstration of the value of copper steel for the purpose.

The President—Does any other gentleman present wish to be heard?

Mr. Miller—I am particularly interested in this paper, and I hate to see the discussion wane. Mr. Hamilton was with the Providence Gas Company when these tests were started, and Mr. Hintze and myself had more or less to do with the test. Now it is getting very close to the time of adjournment, and as Mr. Speller is to give a lecture here to-morrow, I would suggest that Mr. Speller be requested to discuss this paper after his lecture. Possibly it might be advisable for our stenographer to read the remarks that have been made to-day, in order that Mr. Speller and other gentlemen who pos-

sibly may be here will be conversant with the discussion of to-day. I wish to qualify Mr. Carpenter's remarks just a little. He spoke of this holder, with which I had more or less to do. It is not in Providence; it is another holder. I inspected this holder with Mr. Carpenter, and everything he says is true, of course. But there is one thing that was done. Mr. Carpenter put into the tank water a solution of bichromate of potash—you probably know the action of bichromate of potash, that is, in solution. When the solution is put on steel it has the property of stopping the steel from corroding more or less for probably a month, and then this coating seems to disappear. As Mr. Hamilton has stated here, periodically he took his samples, scrubbed and cleaned them, I think with——

Mr. Hamilton—Ammonium citrate.

Mr. Miller—Whatever he cleaned them with. Of course, that is not what we would ordinarily do in practice. We necessarily would not take a holder and scrub and clean it in that way. That may be a point for criticism, but it appears to me that, as it is comparative, it is just as fair for one sample as the other. Recently I received a pamphlet from a company that manufactures wrought iron pipe. No doubt all of the members received a copy. I think 6 or 8 of these pamphlets were directed to various employees of the Providence Gas Company, so no doubt they were circulated universally; and I would like some of these experts in steel and iron to discuss that article. It was stated in the pamphlet that the principal reason why wrought iron, real wrought iron as they express it, I believe, will withstand corrosion, or will last longer than modern steel is on account of the content of slag or silicate of iron. If wrought iron, or steel, or ingot iron, so-called, or any kind of pipe of that kind, will withstand corrosion approximately as well as cast iron pipe, then particularly, in the case of high pressure mains, we want to know about it. I think these questions should be answered, if any of us are capable of answering them, and particularly in regard to that silicate of iron theory. It is an entirely new theory, as far as I know. I have always understood that slag has been considered a detriment to wrought iron.

Mr. Carpenter—As far as the bichromate solution is concerned, I thank Mr. Miller for prompting the point, but the whole structure was not treated in this way, nor was the solution placed in the tank water until after the varnish had disappeared, and our inspection covered guide frame and tank as well, which were not treated.

The President—The time has arrived for closing this session, and I think it right and proper that this discussion be continued to-morrow morning. Arrangements will be made after Mr. Speller's lecture to continue it.

I will declare this session closed, to re-assemble to-morrow morning sharp at 10 o'clock.

(To be Continued.)

Difference between Calculated and Determined Calorific Values of Coal Gas.

[From a Paper read before the Newcastle Section of the Society of Chemical Industry, by G. Weyman.]

In the examination of the gas manufactured at the Elswick and Redheugh works of the Newcastle and Gateshead Gas Company, it was noticed that the difference between the calculated and actually determined calorific values was about 28 B. T. U. per cubic foot for the gas from the horizontal retort plants; and when the vertical retort plant was started at Elswick, it was evident that about 43 B.T.U. would have to be added to the calculated value to bring the gas up to the determined. When, some months later, a tar circulation was introduced, to keep the cross-collecting mains free from thick tar, the difference between the two values decreased considerably. The tar or the circulation, which at first was taken back to the wells as soon as it entered the large main, was subsequently allowed to run with the gas right along to the condensers, and a further decrease in the difference between the two calorific values was noticed. Suspicions of stripping of the gas by the tar were aroused, and the following experiments were made.

A 20-foot holder was filled with gas from the verticals, which was mixed, and allowed to attain a constant temperature. The calorific value was determined and an analysis made. Then gas was passed through a sample of tar at 16° C., taken from the tar outlet beside he works' condensers, and again tested. From the results (Table I.) it is evident that the calorific value of the gas had been reduced 11.7 B. T. U. by passing through the tar, the tar stripping the gas of some hydrocarbons. The calculated calorific value (the constants used are taken from the table in Coste's "Calorific Power Gases") however, is practically the same. and one would imagine that the hydrocarbons removed by the tar are such as are not estimated in the analysis. In fact, the olefines show a slight increase, while the carbon monoxide has suffered by nearly 1 per cent. The methane and hydrogen also show a more change than warranted by experimental error.

Table I.—*Gas and Tar Separated at 72° C.*

	Without Tar.	Tar at 16° C.
Calorific value determined gross	559.3	547.6
Calorific value calculated gross	542.5	543.1
CO_2	0.0	0.0
O_2	0.8	0.8
CnHm	2.1	2.2
CO	8.6	7.8
CH_4	29.9	29.5
H_2	53.2	54.7
N_2	5.4	5.0
	100.0	100.0

Note.—In all the analysis which were made in the Sodeau apparatus the CnHm were absorbed in bromine water; the CH4 and H2 determined by explosion; and the N2 by difference. All the calorific values are in gross B.T.U. per cubic foot.

Another series of experiments was made with the tar at different temperatures. It should be noted that the gas and tar were separated in the works at 72° C., and in the results given in Table II., the calorific value at 75° C. is slightly higher than the original sample of gas, while below this temperature it gradually decreases in value.

Table II.—*Tar and Gas Separated at 72° C.*

	Without Tar.	Tar at 60° C.	Tar at 64° C.	Tar at 70° C.	Tar at 76° C.
Calorific value determined, gross..	555.6	542.0	544.5	553.1	558.8

Other experiments gave confirmatory results, shown in Table III.

Table III.—*Tar and Gas Separated at 72° C.*

	Without Tar.	Tar at 85° C.	Tar at 87° C.	Tar at 92° C.	Tar at 86° C.	Tar at 75° C.	Tar at 60° C.
Calorific value determined, gross.....	543.6	549.6	551.1	554.7	555.2	548.0	535.5
Calorific value calculated, gross.....	545.7	..	....	544.4	....	....	....
CO_2.....	0.0	....	....	0.0	....	....	....
O_2.....	0.4	....	....	0.3	....	....	....
CnHm	2.4	....	....	2.4	....	....	....
CO	9.1	....	....	8.8	....	....	....
CH_4.....	29.4	....	....	29.2	....	....	....
H_2.....	53.1	....	....	53.6	....	....	....
N_2..	5.6	....	...	5.7	....	....	....
	100.0	....	....	100.0	....	....	....

In this series the tar was gradually heated and then slowly cooled; the calorific value and samples for analysis being taken at intervals. The calculated value for the original gas is higher than the determined, but falls below as the temperature at which it passes through the tar is raised above 70° C. Considering these results as a whole, it is quite clear that there are some hydrocarbon vapors in the gas which are not estimated in the analysis, and therefore not included in the calculated figure. These vapors, unlike the hydrocarbons estimated by bromine, are easily removed by tar—in fact, a state of equilibrium exists between tar, gas and hydrocarbon vapor, depending on the temperatures at which they are in contact. The higher the temperature, the greater the amount of vapor in the gas; and if the gas is then removed, it will, of course, carry the vapor with it. Also it is evidently these vapors which make the difference between the calculated and the determined values, rather than any difference in composition of the olefines determined by absorption in bromine water.

The variation in the difference between the calculated and determined values for the vertical plant is clearly due to the lower temperature of separation of tar and gas when the tar circulation was introduced, with consequent reduction in the amount of hydrocarbon vapor present.

These considerations led me to seek a way of estimating these hydrocarbon vapors; and I found that Bunsen had distinguished between the permanent unsaturated gases, ethylene, propylene, etc. (the olefines), and the vapors of volatile saturated hydrocarbons. He found

that the vapors could be dissolved out in absolute alcohol, while the excess of alcoholic vapor could be afterwards removed by water. The estimation must be made before any treatment of the gas, since benzene and other vapors are soluble in caustic soda, cuprous chloride, and other reagents. It is necessary to have the oxygen expelled from alcohol and water by saturation with coal gas.

In order to find out exactly what difference the prior removal of the hydrocarbon vapors would make, I analyzed a sample of gas with and without removing them. The result is given below:

TABLE IV.	Ordinary Method.	Bunsen Method.
Hydrocarbon vapors	....	2.0
CO_2	1.0	0.7
O_2	0.8	0.7
Cn Hm	3.3	2.4
CO	8.0	7.0
CH_4	34.8	31.9
H_2	47.2	48.0
N_2	5.9	6.7
Calorific value determined, gross	618.6	618.6
Calorific value calculated, gross	597.6	624.2

NOTE.—Hydrocarbon vapor assumed to have a calculated value of 3,738 B. T. U. per cubic foot; CnHm, 2301 B. T. U. per cubic foot.

This result is interesting as showing that the 2 per cent. of hydrocarbon vapors, unless previously removed, contributes to the amount of gas absorbed in the various reagents, and is left in sufficient quantity to affect materially the determination of the methane and hydrogen. The olefines show a decrease of 1 per cent., partly to be attributed to the bromine removing some of the vapor (while the caustic soda used to remove the excess of bromine vapor adds to the effect), and also to some absorption of ethylene in the alcohol. The carbon monoxide is affected to a similar extent. The vapor which survived the absorbents in the first case, is much richer in carbons than methane, and this throws the calculation of the hydrogen out.

The apparent discrepancies shown in the analysis of gas passed through tar, described above, are evidently the result of varying amounts of the hydrocarbon vapors. So that, instead of carbon monoxide being apparently dissolved by passing through tar, it is merely due to abstraction of hydrocarbon vapor by the tar. A paper published in the "Journal of the American Chemical Society," for 1908, by Dennis and McCarthy, recommends the use of an ammoniacal solution of nickel cyanide for estimating benzene in coal gas. The solution, however, has to be used after the absorption by caustic soda, leaving the latter free to absorb any hydrogen vapors. The solution also does not absorb homologues of benzene.

It seems a great pity that modern authors have apparently overlooked the presence of these vapors. In one book, published in 1911, benzene is found classed with the unsaturated hydrocarbons, and assumed to be absorbed by bromine. Benzene, of course, is a saturated compound (the aromatic compounds corresponding to ethylene and acetylene are cinnamene and phenyl-acetylene) which is only very slightly attacked by bromine under specific conditions. Moreover, there is (as Bunsen and others have pointed out) a great physical distinction between the hydrocarbon vapors and the permanent gases, ethylene, propylene, etc., and for this reason it is desirable to estimate them separately. The gas manager, for example, need not trouble about the olefines, once they are formed; but the utmost care must be taken if the hydrocarbon vapors are not to be lost in the purification. On the other hand, it is difficult to see how a correct gas analysis can be made unless the vapors are removed beforehand.

In order to complete the investigation, a similar series of experiments to those described were made, except that the hydrocarbon vapors were separated by means of alcohol in the analysis (Table V.)

TABLE V.—*Tar and Gas Separated at 52° C.*

	Without Tar.	Tar at 15° C.	Tar at 60° C.
Calorific value determined, gross	532.3	523.3	542.2
Hydrocarbon vapors	1.3	0.5	1.6
CO_2	0.1	0 1	0.1
O_2	0.2	0.2	0.2
CnHm	2.4	2.4	2.4

The gas passing through tar at 60° C. has a greater calorific value than the original gas, which was not so in the former test till the tar reached over 70° C. This is, of course, because the tar and gas were separated in the works at a lower temperature.

Pyrophoric Alloy Patent Decision.

In the suit of the Treibacher Chemische Werke (Gesellschaft mit Beschrankter Haftung) vs. The Roessler & Hasslacher Chemical Company, a decision has just been rendered in the District Court of the United States, Southern District of New York. The decision, which is writen by Judge Hough, is in favor of the complainant. The patent in question, No. 837,017, issued to Auer Von Welsbach, Nov. 27, 1906, and assigned to the Triebacher Chemische Werke, is held to be valid as a pioneer patent and to be infringed.

From Judge Hough's decision we quote the following:

"The only claim involved is this: 'A pyrophoric alloy, containing cerium, alloyed with iron; substantially as and for the purposes described.'

"The 'purposes described' in the specification render plain the contest before the court.

"The patentee tells the world that all preceeding investigators were wrong in supposing that the so-called 'rare-earth' metals, when pure, possessed pyrophoric capacity, i.e., the property when abraded of giving off particles self-igniting in the air.

"Admittedly these metals, and especially cerium, had long been called pyrophoric, but Welsbach deems himself the first to discover that the spark-giving quality depended on impurities whose presence before him had been unobserved, or if noted considered negligible.

"It is not pretended that this ascertainment of a natural phenomenon constitutes patentable invention.

"Since, however, the cerium ordinarily obtainable had been known to give forth sparks and abrasion, Welsbach says, he sought to ascertain what kind of a mixture would produce sparks in greatest abundance. Iron afforded the best results, and an alloy of cerium 70 per cent. and iron 30 per cent., the maximum pyrophoric effect.

"The sparks elicited are not different from those known to have been drawn from the 'rare-earth' metals as produced from Welsbach's experiments, but the flow from his alloy is said to be so copious and certain as to furnish a 'prompt and reliable' means of igniting 'combustible gases mixed with air.'

"The patentee experimented with 'certain other metals,' and mentions nickel and cobalt as possible ingredients in his alloy, but iron remains the favorite. On alleging as true the substance of the foregoing the patentee sought and obtained the wide claim above quoted

"Defendant has imported and sold a substance manufactured by Kunheim & Company, of Berlin, said to be composed (in accordance with specification of Huber, U. S. Patent 967,775, August 16, 1910), of magnesium, 15 per cent., and cerium, 85 per cent., treated with hydrogen at between 500° C. and 600° C., as long as any absorption of hydrogen can be detected. This magnesium-cerium compound is pyrophoric, the alleged effect of absorbing hydrogen being to increase that quality.

"The defence asserts:

"(1) Welsbach's invention to be void for lack of novelty, *i. e.*, it covers only a 'pre-existing inherent natural property of the alloy.'

"(2) Kunheim's product is not an alloy at all, and, therefore, not an infringement.

"(3) The claim in suit is (in view of the prior art) too narrow to cover any alloy not containing substantially the preferred quantity of iron – or possibly nickel or cobalt.

"As has been often said, where a valuable invention has been made it is the duty of the Court to uphold that which was really invented.

"What Welsbach invented was a metallic alloy having certain desirable qualities—he knew and said that iron was not the only (though it was the most desirable) component with cerium.

"If a metal other than iron be used, does the resultant embody Welsbach's invention? This is the root query.

"The question is one of fact, not law, and the innumerable cases on equivalents are merely statements of how the minds of sundry judges have worked when sitting as jurymen.

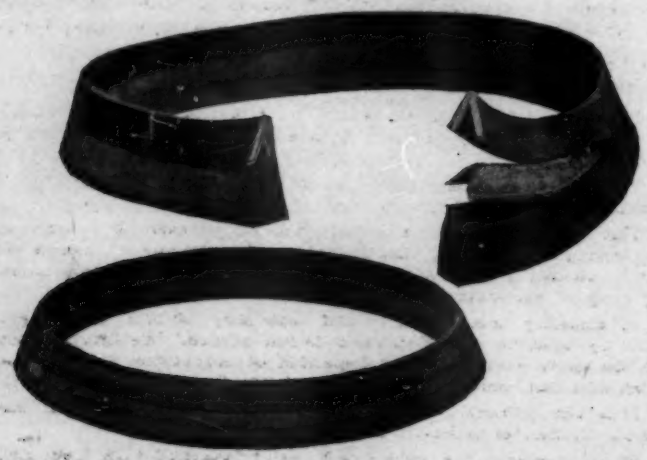
"To me it is obvious that the usefulness of an alloy, *i. e.*, a fusion of metals, was Welsbach's plainly disclosed invention—without knowledge thereof Huber would not have known that it was useful to make an alloy of magnesium and cerium, therefore, he used and uses Welsbach's invention and is an infringer."

New Methods and Appliances.

IMPROVED GASKETS FOR DRESSER JOINTS.—While nothing else equals rubber as a packing ring, owing to its elasticity, resiliency flexibility, etc., the Dresser Manufacturing Company realizes that condensation from artificial gas will in time deteriorate rubber if allowed to come in direct contact with it; and they have been experimenting for some time with a view to developing a gasket impervious to the action of drip oil and other condensations.

The Dresser regular couplings, sleeves and fittings are so constructed that the rubbers are practically hermetically sealed, when

the bolts are drawn up and fittings set—only the thin feather edge being exposed to any condensation in the line. Notwithstanding this, it is possible that in time the condensation will affect plain rubber gaskets so that they will soften and slough away, thus developing serious trouble. To overcome this possible objection, they are now introducing their "Duck Tipped" and "Lead Tipped" gaskets, both of which are recommended unqualifiedly.



The Duck Tipped Gaskets are faced with two plies of duck protecting the exposed section; the Lead Tipped Gasket is of a similar construction with the lead added. The tips not only act as an armor in protecting the rubber, but also keep the rubber confined and under compression. Were the condensations to work through the tips in time and affect or soften the rubber somewhat, the tips will still keep the ring compressed in its original form and prevent the rubber from sloughing away. Tests on these gaskets with drip oil from artificial gas have been most severe and highly satisfactory in every case.

The cut shows the construction of the gasket designed for use in conjunction with Dresser Couplings Style 38 and Long Sleeves Style 40. The duck tipped design can be had in all sizes and in sections suitable for fittings and clamps; and the lead tipped in most of the principal sizes. These special gaskets increase but very slightly the cost of regular Dresser couplings, sleeves, clamps and fittings.

Four 300-Light Meters in Series.

LARGE METER INSALLATION.—What is probably one of the largest gas meter installations on the Pacific Coast, consisting of 4 300-light meters in series, was made recently for the American Can Company plant in San Francisco. The new oxy-acetylene welding process also played a part, for both the service and house riser being welded into position.

The gas distribution department in San Francisco, under Mr. D. E. Keppelman, is an energetic branch of "Pacific Service," and the acccompanying illustration depicts its latest achievement in the line of meter installation.

Items of Interest
FROM VARIOUS LOCALITIES.

"F. R. B.," is informed that Mr. J. Furman Sinnickson succeeded the late Mr. Thomas J. Yorke as President, the Salem (N. J.) Gas Company.

ON the 10th inst. the headquarters and showrooms of the Frederick (Md.) Gas Company were removed to spacious quarters in the Rosenour Building, on East Patrick street. The headquarters are a credit to the Company and a benefit to the city.

MR. NICHOLAS F. BRADY, President, the Municipal Gas Company Albany, N. Y., has submitted to a committee of the Albany Chamber of Commerce, the following schedule of rates on electric current account, subject to the approval of the Public Service Commission for the District. It is also understood, in fact, is so stated, that this schedule will remain in effect until January 1st, 1915, when a further reduction of 10 per cent. will become effective:

Quantities.		Cents, K.W.H.
0 to	100 K.W.H.	9
Next	200 "	8
"	200 "	6
"	200 "	5
"	200 "	4½
"	1,100 "	4
"	1,000 "	3
"	2,000 "	2½
	Excess "	2

MR. CHARLES H. NETTLETON, President, the New Haven (Conn.) Gas Company, accompanied by his daughter, Miss Katherine, and her friend, Miss Susan Norcross, sailed for Europe, Saturday, the 4th inst., for a protracted journey to and through Southern Europe.

MR. R. L. RAND, Manager of the Anniston (Ala.) Electric and Gas Company, succeeding thereto the late Mr. Howard W. Sexton, has accepted the position of Vice-President and General Manager of the electric railway interests, Staten Island, N. Y. His successor at Anniston is J. W. Hall.

JUDGE THOMAS P. RILEY has offered 3 prizes, totalling $100 in gold, for the three best speeches on "Municipal Ownership of Gas and Electric Lighting Plants," to be contended for by the members of the graduating classes of the High and certain other named schools of Boston. The first prize will be $50; the second and third prizes $25 each. The contest is to take place some time in June.

THE city of Rocky Mount, N. C., will, on May 6th, open bids for the furnishing and erecting of machinery for a water gas plant, to comprise one 4-foot set, and a holder up to retaining 50,000 cubic feet. For particulars application should be made to F. L. Marshall, 1001 Mutual Building, Richmond, Va.

THE Waterbury (Conn.) Gas Light Company, which has for some years been operated under leasehold by the United Gas Improvement Company, has, we are informed, reverted to its owners. However, Mr. Edwin H. Williams continues General Manager of the Corporation, and all correspondence, invoices, shipments of goods, etc., should be addressed to the the Waterbury Gas Light Company. In fact, the actual operating conditions will show no marked change.

ADVICE by way of Dunkirk, N. Y., are to the effect that the Frost Gas Company, of Fredonia, N. Y., is arranging to extend its main system to and through the villages of Cassadaga and Stockton. This will necessitate the placing of 12 or more miles of pipe, and the expectation is that the work will be completed by August 1st.

MR. THURSTON OWENS has been appointed Secretary and General Manager, the San Diego Gas and Electric Appliance Company, with headquarters in 939 Sixth street, San Diego. In the announcement it is stated that the Company was organized to install and maintain complete gas and electric equipments in all classes of buildings; to install house piping and wiring, ranges, water heaters, fixtures, lamps and the like. And an especial feature will be the maintenance of appliances on a regular monthly basis. The Company proposes to have headquarters, the assembling and "show place for gas and electric appliances of the latest and most efficient models."

AT the annual meeting of the Public Service Corporation of New Jersey the following Board of Directors was re-elected: William C. Heppenheimer, Edgar B. Ward, Edwin W. Hine, Lewis Lillie, William Scheerer, Peter F. Wanser and Horatio Lloyd.

AT the last monthly meeting of the Employees Club, the Athol-Gardner (Mass.) Gas (etc.), Companies, the speaker of the evening was Mr. E. F. Goggin, of the Marlboro-Hudson Gas Company, whose story had to do mainly with some happenings that occurred at a meeting of a gas association attended by him some time ago.

THE shareholders of the Citizens Gas Company, Vineland, N. J., in annual meeting some days ago, seemed quite satisfied with the re-

ports submitted by their executives. It was virtually determined to make certain extensions to the distributing division, and these officers were elected: Directors, H. C. Bartlett, Stuart F. Morris, L. H. Burge, S. J. Franklin, E. G. Jones, D. H. Burge, James Craig, Walter Owen, C. M. Gray, Mornington Roberts, A. Bandriff, Jr., C. M. Nixon and H. J. Souders; President, Walter Owen; Vice President, D. H. Burge; Treasurer and General Manager, S. J. Franklin; Secretary, C. M. Nixon.

THE Gas Machinery Company, Cleveland, O., has been awarded a contract by the Decatur (Ills.) Railway and Light Company for coke trestle and coke loading bins, to facilitate the handling of coke from the new inclined bench installation. The new coal gas benches are being fired up, and will be ready for practical operation within the next 2 or 3 weeks. The coke trestle and bins will be rushed to completion so that these will be available for use when the new benches are operating at full capacity.

ATTORNEY GENERAL BOYNTON, of Massachusetts, is responsible for this statement, respecting the discontinuance of the action maintained by the Haverhill Gas Company against the authorities in respect of obliging the Company to sell gas at a minimum of 80 cents per 1,000 cubic feet:

"By an order entered in the United States District Court, the litigation, which has been actively going on for nearly 2 years, between the Haverhill Gas Light Company and the Board of Gas and Electric Light Commissioners, is disposed of. The Commissioners (Jan., 1913) ordered a reduction in the price of gas in Haverhill to 80 cents per 1,000. The Company brought suit in the U. S. District Court against the enforcement of this order, and obtained an injunction against the Commissioners and the Attorney General to prevent any action by them to carry the order into effect. The case was referred to a Special Master, and the taking of evidence has been going on for many months. The case has been regarded by the officials interested as perhaps the most important litigation with reference to the authority of the State, and to the value of the orders of Commissioners, ever undertaken in this Commonwealth. Special appropriations have been made by the Legislature to enable the Attorney General to properly carry on the defence, as it was believed that the authority of the Commonwealth must be maintained at any cost. The order of the Court disposing of the case is entered by agreement of the attorneys and dissolves the injunction against the Commissioners and dismisses the suit, leaving as a result a complete victory for the Commissioners."

Meanwhile, to an overlooker at this distance from the scene of action, and apart from the merit or not of an 80 cent gas rate for Haverhill, and if memory serves aright, this long-drawn out case would never have been, were it not for the high-and-mighty attitude taken over the situation by a then ranking-official in the Company. So, after, all, perhaps a personal element had something to do with the case.

"T. V. M." is informed that the officers in charge of the affairs of the Cohoes (N.Y.) Gas Light Company are: President and Treasurer, L. D. Temple; Sesretary, William Parsons; Assistant Secretary, D. H. Van Auken.

THE Massachusetts Board of Gas and Electric Light Commissioners has given permission to the Leominister (Mass.) Gas Light Company to issue new capital in the sum of $85,000—its present or old capital is $55,000. The petition was strongly combated by the Selectmen, who, fortified by special Counsel, argued against any increase, when the matter was being argued before the Commissioners. The opposition was almost entirely built on the thought that, as the Company was earning quite a goodly return, an increase in capital would put off the period of a reduction in selling rates. In the decision it is declared that, as the Company has paid off about $30,000 of floating debt since the petition was filed, in reality the increase allowed is in effect but $50,000, which sum the Commissioners do not consider unreasonable, in view of the necessity that exists for extending and improving the plant.

ADVICES by way of Toronto, Ont., dated the 11th inst., are to the effect that the action of the Government in reducing the duty on bituminous coal entering Canada promises to culminate in the construction, at Hamilton, Ont., of a coke and gas plant at the instance of the United Gas and Fuel Company, at an estimated cost of $2,000,000.

SOME evenings ago the Board of Aldermen, La Crosse, Wis., voted to appeal to the State Railroad Commission for an order to cause the Wisconsin Gas and Electric Company to make a sensible reduction in its charges for gas. The resolution also empowers the City Attorney to hire experts to "help along the cause." The attention of Doctor Bemis is called to this opportunity for harassing the La Crosse folks. The Mayor (his name is Goodland), during the "speech explosions" favoring the measure, made a particularly offensive attack on the corporation, charging the latter with indictiveness and "overbearingness" (whatever that may be) in its dealings with the city. He declared the city had ample funds "To fight the Corporation," and should "Carry the battle to the last ditch, once it is started." "Hoop, de doodle: Do!"

MR. RUSSELL G. CHASE, Vice-President and General Manager, the Sun Vapor and Gas Street Light Company, Canton, O., and his associates, have good reasons to be satisfied with the results that are attending the installation of gas cluster lights recently made by them at certain points in Ohio; notably, around the Marion County Court House; the Court House structure, Canton; and the Wyandotte County Court House, at Upper Sandusky. These installations, chiefly working on natural gas, are certainly giving satisfaction to the residents of the named places. Respecting the Marion installation, the leading local paper ("The Star") had this to say: "The cluster lights installed around the Court House, were lighted for the first time the night of the 10th inst., and attracted much attention. Marion business men and citizens in general spoke of a desire to have the entire business section of the city similarly lighted, and judging from the expression of some, petitions will be presented to Council for lights of a similar nature on other streets in the central part of the city. Many people who visited the business section, Friday evening, were attracted by the appearance of the lights, and many went out of their way to inspect them. The 10 cluster lights, of 5 lamps each, light up the esplanade of the Court House in a most effective way. To some, however, the location of the posts was a disappointment. The lights are situated on the street next to the curb, with the exception of one on the north side of the building. Of the 10 lights about the building, 3 are on Main street, one close to the corner of Center Street, and the others on Center street. They are about 40 feet apart, and furnish brilliant rays on the street and over the esplanade. The Court House officials and the County Commissioners as well, are quite pleased with the system, and it is probable that a few more may be installed to light the alley at the East of the building and another on Court street."

THE City Council, of Atlanta, Ga., has so amended the rules governing the qualifications of the City Smoke and Gas Inspector, that hereafter he who aspires to the place need not necessarily be a college graduate. The job is worth $2,400 per annum, which would not go far towards "living high," even in the South.

PLYMOUTH, MICH., recently voted in favor of a proposition to grant to certain Detroit capitalists the right to operate a gas plant for a term of 30 years.

"B. L. F.," writing from Newport, R. I., under date of the 12th inst., says: "I fail to note any mention in our JOURNAL (I write 'our,' for I would be decidedly out-of-sorts did I not find it in my mail box each Monday morning) of the death of Mr. Thomas A. Lawton, long connected with the administration of the Newport Gas Light Company, and a well loved resident of Newport, in which city he was born June 17th, 1853. His death occurred on the morning of March 22d, and the summons was served most summarily. In fact, he had just placed some hickory sticks on the fire in the hearth, preparatory to sitting down for a quiet Sunday evening in his reading room, when the end came. While a mere boy he entered the service of the Savings Bank of Newport, as a junior helper, and that connection continued until his death, although his connections with it as a salaried employee ceased some years ago. He had become Assistant Treasurer at the time of his retirement (1887) and a few years later was elected to its Board of Trustees. In later years he was largely concerned in settling the affairs of the large estate left by Mr. Alfred Smith. He is survived by his widow, a brother (City Engineer, Mr. H. Lawton) and a sister, Mrs. B. B. H. Sherman. He was a genial, kindly man, and his beautiful home on Broadway, was surrounded by a broad acreage, devoted mainly to the propagating of flowers and fruit trees, the care of which was his devoted hobby."

Utilities Commission News.

TO AMORTIZE BOND DISCOUNT.—The Missouri Commission has authorized the Southwest Missouri Ry. Co. to issue $80,000 5 per cent. bonds, covered by mortgage of September 1, 1906, at not less than 90, the difference between the net price realized and the face value to be amortized within 12 months, out of the operating earnings of the road.

INDIANAPOLIS VALUATION.—An inventory of the property of the Indianapolis Light and Heat Company, has been filed with the Public Service Commission of Indiana. The inventory was made by engineers under the direction of Mr. W. J. Huddle, of Sloan, Huddle, Fuestel & Freeman, Madison, Wis., by order of the Commission, which is considering rates of the Indianapolis companies for light and heat. The Commission expects to begin the consideration of the evidence within a short time, and hearings on the valuation of the plants may be held. Whether the Commission will make another inventory of the plants on its own initiative has not been made public.

DEPOSITS FROM RENTERS.—The Washington State Commission interprets Rule 9 for the regulation of water, gas and electric companies to mean that a deposit may be required from a new customer, or from an old customer who moves to a new location and does not own the premises occupied; the company may waive deposit and accept a guarantee; in the case of consumers owning the premises, it may waive both deposit and guarantee; the company has the right, in exceptional cases, to require deposit or guarantee of a consumer owning his own premises, but from whom it has been difficult to collect, or whose credit is known to be poor.

BEMIS TESTIMONY THROWN OUT.—This is quoted from a brief submitted in a rate case before the New Jersey Court of Errors and Appeals:

"Professor Bemis, called by the municipalities, testified at considerable length. The Commission, however, rejected his testimony altogether, as his testimony had been rejected a short time before by Judge Sloan in the Des Moines gas case. The Professor took successively parts of the physical property of the Company and applied them unit costs obviously and undoubtedly incomplete and reached a conclusion as to the costs, not the value, of the property. He then added together his estimates of cost—the total, including working capital and preliminary expenses, amounting to $3,561,906—and insists that the sum is the amount upon which the Company is entitled to an income."

Professor Bemis testified some years ago at Baltimore as follows:

"I have for years been studying the relation of the divided profit of gas companies to their total value, and find that in large cities such as Boston, New York, Philadelphia, Washington and Brooklyn, the company is worth more than 20 times its divided profits; that a capitalization of 5 per cent. is a very conservative capitalization, based upon the profits they yearly divide.

"Applying that method of ascertaining the value of a gas plant to the gas property in the Passaic division, its value would be $9,388,142.60—that is, $469,407.13, the divided income in 1911, multiplied by 20. He attempted, however, to dissipate the effect of his testimony on that point by stating that a gas property is worth 20 times its divided income, if its directors fix its rates and not when rates are subjected to reduction by a commission. That statement, if true, would mean that a gas company in New Jersey, worth at least $9,388,142.60 prior to the passage of our utility act, was thereby reduced in value to $3,561,906. That is to say, nearly two-thirds of the value of the property recognized and taxable by law and capitalized according to law, was destroyed by the mere passage of the utility act. This proposition is so startling and monstrous that merely to state it fairly is to dispose of it utterly."

INDIANA COMMISSION OBJECTS TO PRIVATE CONTRACTS FOR SERVICE.—The Commission in considering the case of authorizing connections to privately extended water mains, took the same position as in the case of the Citizens Gas Company, of Indianapolis, when it wished authorization of a blanket contract with private individuals.

Several situations were pending at that time in which the Company desired to make contracts for extensions in remote parts of its territory, under which the consumers should pay the total cost of the placing of the mains, and this money to be refunded to them when the income from gas sold to these consumers had reached the amount it cost to place the mains.

The Commission refused to approve such a form of contract on the theory that sections of the utility law prohibited such private contracts with individuals, and that the general method to follow in such cases was for the utility to make the extensions at its own cost, wherever practicable.

The Market FOR GAS SECURITIES.

There wasn't any market for Consolidated gas last week, save it is known that 200 shares changed hands on the Exchange yesterday (Thursday) at 130. That figure is bid this noon for it. The bond market, however, keeps active. We note these recent sales: New York Gas, Electric Light, Heat and Power Company, 5's, $2,000, at 104⅛; $5,000, ditto, 4's, at 86¼ to 86½. The general situation is favorable to the invester.

Brooklyn Union is absolutely featureless, although everything in connection with its business makes directly for increasing output on good average takes per month per meter. We note a sale yesterday of $1,000, of its 5's, at the very low figure of 105½.

Other bond sales were these: Milwaukee, firsts, 4's; $2,000, at 90⅛; Peoples Gas Light and Coke, Chicago, con. 5's, at 115½; Cal. Gas and Electric 5's, $1,000, at 94; Chicago Gas Light and Coke, old 5's, $1,000, at 103½.

The net earned by Pacific Gas and Electric during 1913 is returned at $6,871,000. Out of this interest charges of $3,902,000, and bond discount and expense were represented by a charge of $246,000. Everything off, there remained $2,723,000, applicable to preferred dividends, sinking fund, depreciation, etc. There is little fear in respect of the declaration of the last quarter's dividend on the preferred of $1.50 per share. The meeting on such account will be held April 30th.

The output of the Old Colony (Mass.) Gas Company for the 9 months of its fiscal year (to March 31) is returned at 46,050,000 cubic feet, as against 32,125,000 cubic feet to like period in 1913.

The regular quarterly of 3 per cent. on Fall River (Mass.) shares has been declared. The firms of N. H. Halsey & Co., and Harris, Forbes & Co., have purchased $2,000,000 short notes (due March 25, 1915, being the remaining unsold of an authorized $7,000,000 issue) issued by the Pacific Gas and Electric Company.

Peoples Gas holds steady. Its regular quarterly of 2 per cent. has been declared and made payable the 25th prox. U. G. I. shares are steady at 166 to 167, and Montreal Light, Heat & Power Company fairly well maintains its recent marked advance, the figures being 219½ to 220.

GAS STOCKS.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

APRIL 20.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$99,816,500	100	130	130¼
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	101	104
Mutual Gas Co.	3,500,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	59	62
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	96	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	105	102
Standard	5,000,000	100	102	104
Preferred	5,000,000	100	93	94
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	91	93
The Brooklyn Union	15,000,000	1,000	126	128
1st Con. 5's, due 1948, M. & N.	15,000,000	—	102	103
Yonkers	999,650	500	180	—
Out-of-Town Companies.				
Detroit Gas Co., 5's	881,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100¼
Equitable Gas & Fuel Co.,				
Chicago, Bonds	2,000,000	1,000	—	101
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Essex and Hudson Gas Co.	6,500,000	—	188	188
Hartford	750,000	25	190	200
Laclede Gas Co., St. Louis.	10,000,000	100	96	97
Preferred	2,500,000	100	—	102½
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	130
Massachusetts Gas Companies, of Boston	25,000,000	100	89½	90
Preferred	25,000,000	100	91½	92
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Montreal L. H. & P., Canada	2,000,000	100	219½	220
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	120½	122
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Pacific Gas and Electric Co.	15,500,000	—	28	30
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	900,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
United Gas Imp. Co.	55,502,950	50	166	64½
Washington (D. C.) Gas Co.	1,600,000	200	405	410
Western Gas Co., Milwaukee	4,000,000	—	—	—